

DAY 2 – MOBILE6.2 Emissions Modeling

July 7, 2006

EPA's MOBILE6.2 Model

Regulatory tool for predicting emission factors for on-road mobile sources in units of grams per vehicle-mile traveled (g/VMT)

Emission inventories are constructed from the product sum of vehicle activity (VMT/day) and MOBILE6.2 composite emission factors

Emission Rate = MOBILE6.2 Emission Factor × Vehicle-Miles Traveled

Emission rates reported on a tons per day or tons per year basis

EPA's MOBILE6.2 Model (continued)

Applicable to a regional scale

An empirical model based on thousands of EPA measurements under laboratory conditions (mostly pre-1990) and testing by vehicle manufacturers (1990-1993)

And a substantial database of results from inspection/maintenance program testing in Dayton, Ohio (180,000 cars and trucks); Wisconsin (4,400 cars and trucks); Hammond, Indiana; and Phoenix, Arizona

EPA's Federal Test Procedure (FTP)

Source of the Base Emission Rates in MOBILE6.2

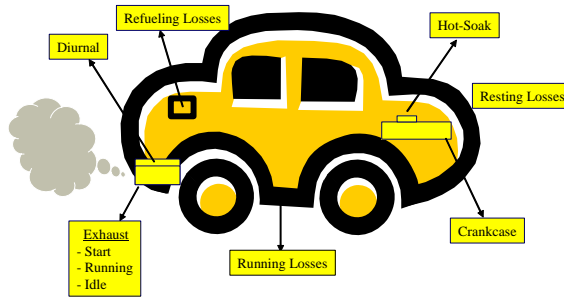
Also known as the LA4 Cycle

Used to certify new cars for sale since the 1970s

Stats

- Total length = 7.5 miles
- Duration = 22.86 minutes
- Average speed = 19.6 mph

Generation of Emissions



Lesson 4: MOBILE6 Mobile Source Emissions Factor Model Structure

MOBILE6 - Notepad

File Edit Format View Help

Calendar Year: 2012
Month: July
Altitude: Low
Minimum Temperature: 64.0 (F)
Maximum Temperature: 92.0 (F)
Absolute Humidity: 11.5 grains/lb
Nominal Fuel RVP: 7.0 psi
Weathered RVP: 6.8 psi
Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes
Evap I/M Program: No
ATF Program: Yes
Reformulated Gas: No

Emissions determined from WEEKEND hourly vehicle activity fractions.

Ether Blend Market Share: 0.500 Alcohol Blend Market Share: 0.500
Ether Blend Oxygen Content: 0.020 Alcohol Blend Oxygen Content: 0.010
Alcohol Blend RVP waiver: No

vehicle type:	LDGV	LDGT12	LDGT14	LDGT	HDGV	LDGV	LDGT	HDGV	MC	All veh
WHT Distribution:	0.3521	0.3844	0.1313	0.0378	0.0019	0.0013	0.0042	0.0050	1.0000	
Composite Emission Factors (g/mi):										
Composite VOC :	0.287	0.386	0.801	0.492	1.001	0.400	0.651	0.332	2.08	0.427
Composite CO :	1.69	4.76	5.37	6.84	1.190	1.150	1.282	14.32	4.514	
Composite NOx :	0.277	0.355	0.645	0.429	1.178	1.195	0.909	4.843	1.00	0.819
Exhaust emissions (g/mi):										
VOC Start:	0.041	0.063	0.126	0.079	0.121	0.280		0.381		
VOC Running:	0.048	0.087	0.175	0.109	0.278	0.371		1.215		
VOC Total Exhaust:	0.088	0.150	0.301	0.188	0.209	0.400	0.651	0.332	1.60	0.175
CO Start:	1.05	1.43	2.16	1.62	0.529	0.576		2.864		
CO Running:	2.64	3.33	5.01	3.76	0.862	0.574		11.454		
CO Total Exhaust:	3.69	4.76	7.17	5.37	1.390	1.150	1.282	14.32	4.514	
NOx Start:	0.037	0.058	0.111	0.073	0.042	0.093		0.116		
NOx Running:	0.240	0.297	0.535	0.357	1.153	0.855		0.685		
NOx Total Exhaust:	0.277	0.355	0.645	0.429	1.178	1.195	0.909	4.843	1.00	0.819
Non-exhaust emissions (g/mi):										
Hot Soak Loss:	0.051	0.064	0.141	0.084	0.251	0.000	0.000	0.132	0.071	
Diurnal Loss:	0.011	0.015	0.033	0.020	0.032	0.000	0.000	0.021	0.016	
Resting Loss:	0.042	0.058	0.133	0.077	0.188	0.000	0.000	0.129	0.062	
Running Loss:	0.084	0.073	0.132	0.095	0.195	0.000	0.000	0.000	0.079	
Crankcase Loss:	0.004	0.009	0.010	0.009	0.010	0.000	0.000	0.000	0.007	
Refueling Loss:	0.006	0.016	0.031	0.020	0.096	0.000	0.000	0.000	0.016	
Total Non-exhaust:	0.178	0.236	0.500	0.306	0.792	0.000	0.000	0.481	0.252	

Ln 1, Col 1

Pertinent Data for Use in MOBILE6.2

Relevant MOBILE6.2 Parameters

- Specifying Pollutants and Output Options
- External Conditions
- Vehicle Fleet Characteristics
- Vehicle Activity
- Vehicle Fuel Specifications
- State Programs

While these factors affect the magnitude of MSAT emissions specific to a locale; most are common to all project alternatives under review

Notable exceptions – certain vehicle activity parameters

Pertinent Data for Use in MOBILE6.2 (continued)

Review of MOBILE6.2 Commands

- EPA Technical Guidance
- FHWA Technical Guidance
- Methods for Assigning Values
- Command Structure
- Explanation



Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation



Technical Description of the Toxics Module for MOBILE6.2 and Guidance on Its Use for Emission Inventory Preparation

Constructing an Input File

MOBILE6.2 Input Files are assembled in 3 sections

- HEADER
- RUN
- SCENARIO

4 Separator Commands

- MOBILE6 INPUT FILE
- RUN DATA
- SCENARIO RECORD
- END OF RUN

Example MOBILE6.2 Input File for Project-Level Assessments

```
* INPUT FILE: Project.in; OUTPUT FILES: Project.txt, Project.pm, Project.tox, Project.tab
* 1 2 3 4 5 6 7 8 9
*234567890123456789012345678901234567890123456789012345678901234567890
```

***** Header Section *****

MOBILE6 INPUT FILE :

> Transportation Conformity Workshop – Phoenix, Arizona – July 6-7, 2006 – M. Claggett

> Specifying Pollutants

* For CO Hot-Spot Analyses
POLLUTANTS : CO

* For PM and PM-2.5 Precursor Analyses
POLLUTANTS : HC NOx
PARTICULATES :

* For Project-Level MSAT Analyses
PARTICULATES : ECARBON OCARBON SO4
AIR TOXICS : BENZ BUTA FORM ACET ACRO

SPREADSHEET :
RUN DATA :

Example MOBILE6.2 Input File for Project-Level Assessments (continued)

***** Run Section 1 *****
* Parameters not likely to change across Scenarios

> Descriptive Output Options

EXPAND EXHAUST :
NO REFUELING :

> Vehicle Fleet Characteristics

REG DIST : REGDATA.D

> Vehicle Activity

* The emissions component due to vehicle engine starts should not typically be included in
* a project-level MSAT analysis. Use NOSTARTS.D or rely on national defaults in STPERDAY.D

STARTS PER DAY : NOSTARTS.D

*STARTS PER DAY : STPERDAY.D

> Vehicle Fuel Specifications

FUEL PROGRAM : 1

> State Programs

* Substitute locale-specific I/M and ATP information or remove the

* I/M DESC FILE and ANTI-TAMP PROG commands if no local information applies or is available

I/M DESC FILE : IMTEST.D

ANTI-TAMP PROG :

83 75 50 22222 22222222 2 11 096. 22222222

Example MOBILE6.2 Input File for Project-Level Assessments (continued)

***** Scenario 1 *****

* Required Scenario Commands and Parameters likely to change by Scenario

SCENARIO REC : Project Alternate by Calendar Year by Month/Season by Hour

> Specifying Pollutants (Required Scenario Commands)

PARTICULATE EF : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV

* Specify an appropriate, single Particle Size (typically, PM-10 or PM-2.5) for the Scenario

PARTICLE SIZE : 10.0

*PARTICLE SIZE : 2.5

> External Conditions (May change by evaluation year, month/season)

CALENDAR YEAR : 2005

EVALUATION MONTH : 7

ALTITUDE : 1

MIN/MAX TEMP : 64.0 92.0

ABSOLUTE HUMIDITY : 75.0

Example MOBILE6.2 Input File for Project-Level Assessments (continued)

```
> Vehicle Activity (May change by Alternate)
* Substitute locale-specific VMT fractions by vehicle class or remove the
* VMT FRACTIONS command to rely on national defaults if no local information is available
VMT FRACTIONS      :
0.354 0.089 0.297 0.092 0.041 0.040 0.004 0.003
0.002 0.008 0.010 0.012 0.040 0.002 0.001 0.005
VMT BY HOUR        : HVMT.DEF
* Vehicle speeds may be accounted for using the VMT BY FACILITY and SPEED VMT commands or
* the AVERAGE SPEED command (as in a speed look-up table)
AVERAGE SPEED      : 36.5 FREEWAY 92.0 0.0 0.0 8.0
*VMT BY FACILITY    : FVMT.DEF
*SPEED VMT          : SVMT.DEF
```

Example MOBILE6.2 Input File for Project-Level Assessments (continued)

```
> Vehicle Fuel Specifications (May change by evaluation year, month/season)
FUEL RVP            : 12.5
* Substitute locale-specific data or remove the OXYGENATED FUELS command
* If no local information is available or if conducting a PM or MSAT analysis
OXYGENATED FUELS    : 0.035 0.129 0.027 0.031 2

* Required for PM analysis
DIESEL SULFUR        : 350.0

* Required for MSAT analysis
GAS AROMATIC%        : 25.0
GAS OLEFIN%          : 15.0
GAS BENZENE%         : 1.5
E200                 : 50.0
E300                 : 85.0
OXYGENATE             : MTBE 15.1 0.50
                     : ETBE 17.6 0.05
                     : ETOH 10.0 0.45
                     : TAME 6.0 0.00
```

```
***** End of Run 1 *****
END OF RUN          :
```

Specifying Pollutants

Project-Level Applicability:

- Carbon Monoxide (CO)
- Particulate Matter (PM)
 - ≤ 10 micrometers (PM-10)
 - ≤ 2.5 micrometers (PM-2.5) plus precursors
- Mobile source air toxics (MSATs)
 - Acetaldehyde
 - Acrolein
 - Benzene
 - 1,3-Butadiene
 - Diesel Particulate Matter (DPM)
 - Formaldehyde

Specifying Which Pollutants are Reported

Stipulate which emission factors are to be calculated and reported specific to the analysis being conducted, i.e., CO for CO hot-spot analyses or HC and NOX for PM-2.5 precursor analyses

POLLUTANTS : CO

Optional Command

Default = VOC, CO,
NOx are reported

Header Section

Particulate Matter (PM) Pollutants

Specify the relevant individual emission components, as applicable

PARTICULATES :

Required Command	Default = All 9 PM Components	Header Section
------------------	-------------------------------	----------------

Lead – Lead Exhaust

GASPM – Sum of the Organic Carbon Portion and the Elemental/Residual Carbon Portion of Gasoline Exhaust

Particulate Matter (PM) Pollutants (continued)

ECARBON – Elemental/Residual Carbon Portion of Diesel Exhaust

OCARBON – Organic Carbon Portion of Diesel Exhaust

SO4 – Sulfate Exhaust

Total Diesel PM = ECARBON + OCARBON + SO4

Particulate Matter (PM) Pollutants (continued)

TIRE – PM from Tire Wear

BRAKE – PM from Brake Wear

SO₂ – Gaseous Sulfur Dioxide Exhaust

NH₃ – Gaseous Ammonia Exhaust

Particulate Emission Factor Data

Specify the default PM emission factor data files provided by the EPA with the MOBILE6.2 model

**PARTICULATE EF : PMGZML. CSV PMGDR1. CSV
PMGDR2. CSV PMDZML. CSV
PMDDR1. CSV PMDDR2. CSV**

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

All six file names need to be entered on the same line in sequential order

If the files are not located in the 'RUN' directory, the path must be specified

Particle Size

Specify a particle size of 10 micrometers (μm)

PARTICLE SIZE : 10

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

**PM Emissions Factors Can Be Specified for a Particle Size
Ranging from 1.0 to 10.0 μm (e.g., PM-2.5, PM-10)**

Primary Air Toxic Pollutants

Specify the Priority MSATs

AIR TOXICS : BENZ BUTA FORM ACET ACRO

Required Command	Default = All 6 Primary Air Toxics	Header Section
------------------	---------------------------------------	----------------

BENZ – Benzene

MTBE – Methyl Tertiary Butyl Ether

BUTA – 1,3-Butadiene

FORM – Formaldehyde

ACET – Acetaldehyde

ACRO – Acrolein

Highway Emission Components

A significant portion of mobile source emissions do not occur on major freeways and arterials:

- Exhaust emissions from a vehicle start occur at the beginning of a trip
- Hot-soak evaporative emissions occur from a parked vehicle at the end of a trip
- Refueling evaporative emissions occur at the gas station
- Evaporative emissions from the gas tank occur mainly from parked vehicles
- And resting evaporative emissions occur from parked vehicles

No Refueling Emissions

Exclude Stage II emissions from the MOBILE6.2 calculations

NO REFUELING :

Optional Command	Default = Refueling Emissions Reported	Run Section
------------------	--	-------------

Refueling emissions occur at the gas pump and not on highway facilities

Expand Exhaust Emissions in the Descriptive Output

Display separate start, running, and total (running + start) exhaust emission factors in the descriptive output in addition to the composite emission factors

EXPAND EXHAUST :

Optional Command	Default = Report only composite EF	Scenario Section
------------------	------------------------------------	------------------

The exhaust emission component due to vehicle engine starts occur at the beginning of a trip. Typically, only running exhaust emissions occur on major arterial or freeway facilities.

MOBILE6 - Notepad

File Edit Format View Help

Calendar Year: 2012
Month: July
Altitude: Low
Minimum Temperature: 64.0 (F)
Maximum Temperature: 92.0 (F)
Absolute Humidity: 11.5 grains/lb
Nominal Fuel RVP: 7.0 psi
Weathered RVP: 6.8 psi
Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes
Evap I/M Program: No
ATP Program: Yes
Reformulated Gas: No

Emissions determined from WEEKEND hourly vehicle activity fractions.

Ether Blend Market Share: 0.500 Alcohol Blend Market Share: 0.500
Ether Blend Oxygen Content: 0.020 Alcohol Blend Oxygen Content: 0.010
Alcohol Blend RVP waiver: No

vehicle type:	LDGV	LDGT12	LDGT14	LDGT	HDGV	LDGV	LDGT	HDGV	MC	All veh
WHT Distribution:	0.3521	0.3844	0.1313	0.0378	0.0019	0.0013	0.0042	0.0050	1.0000	
Composite Emission Factors (g/mi):										
Composite VOC :	0.29	0.386	0.801	0.492	1.001	0.400	0.651	0.332	2.08	0.427
Composite CO :	1.69	4.76	7.17	5.37	6.84	1.190	1.150	1.282	14.32	4.514
Composite NOx :	0.277	0.355	0.645	0.429	2.178	1.195	0.909	4.843	1.00	0.819
Exhaust emissions (g/mi):										
VOC Start:	0.041	0.063	0.126	0.079	0.121	0.280			0.381	
VOC Running:	0.048	0.087	0.175	0.109	0.278	0.371			1.215	
VOC Total Exhaust:	0.088	0.150	0.301	0.188	0.209	0.400	0.651	0.332	1.60	0.175
CO Start:	1.05	1.43	2.16	1.62	0.529	0.576			2.864	
CO Running:	2.64	3.33	5.01	3.76	0.862	0.574			11.454	
CO Total Exhaust:	3.69	4.76	7.17	5.37	6.84	1.190	1.150	1.282	14.32	4.514
NOx Start:	0.037	0.058	0.111	0.073	0.042	0.053			0.116	
NOx Running:	0.240	0.297	0.535	0.357	1.153	0.855			0.685	
NOx Total Exhaust:	0.277	0.355	0.645	0.429	2.178	1.195	0.909	4.843	1.00	0.819
Non-exhaust emissions (g/mi):										
Hot Soak Loss:	0.051	0.064	0.141	0.084	0.251	0.000	0.000	0.000	0.132	0.071
Drainage Loss:	0.011	0.015	0.033	0.020	0.032	0.000	0.000	0.000	0.021	0.016
Resting Loss:	0.042	0.058	0.123	0.077	0.188	0.000	0.000	0.000	0.129	0.062
Running Loss:	0.084	0.073	0.132	0.095	0.195	0.000	0.000	0.000	0.000	0.079
Crankcase Loss:	0.004	0.009	0.010	0.009	0.010	0.000	0.000	0.000	0.000	0.007
Refueling Loss:	0.006	0.016	0.031	0.020	0.096	0.000	0.000	0.000	0.000	0.016
Total Non-exhaust:	0.178	0.236	0.500	0.306	0.792	0.000	0.000	0.000	0.481	0.252

Ln 1, Col 1

Example PM Descriptive File

* MOBILE6.2.03 (24-Sep-2003)
* Input File: EXAMPLES\EXAMPLE9.IN (file 1, run 1).

* #####
* Example Input File
* File 1, Run 1, Scenario 1.
* #####

Calendar Year: 2002										
Month: Jan.										
Gasoline Fuel Sulfur Content: 279 ppm										
Diesel Fuel Sulfur Content: 500 ppm										
Particle Size Cutoff: 10.00 Microns										
Reformulated Gas: No										
Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4638	0.3052	0.1042		0.0357	0.0008	0.0017	0.0827	0.0060	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	-----	-----	-----	0.0000	0.0000
GASPM:	0.0044	0.0052	0.0118	0.0068	0.0756	-----	-----	-----	0.0205	0.0077
ECARBON:	-----	-----	-----	-----	-----	0.1838	0.0813	0.2794	-----	0.0234
OCARBON:	-----	-----	-----	-----	-----	0.0518	0.1169	0.1388	-----	0.0117
SO4:	0.0036	0.0051	0.0055	0.0052	0.0084	0.0058	0.0094	0.0314	0.0010	0.0067
Total Exhaust PM:	0.0080	0.0103	0.0173	0.0120	0.0841	0.2414	0.2076	0.4495	0.0215	0.0495
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0088	0.0080	0.0080	0.0260	0.0040	0.0095
Total PM:	0.0286	0.0308	0.0378	0.0326	0.1054	0.2619	0.2281	0.4881	0.0381	0.0715
SO2:	0.0635	0.0807	0.1061	0.0871	0.1617	0.1106	0.1795	0.4485	0.0305	0.1085
NH3:	0.1009	0.0990	0.0939	0.0977	0.0451	0.0068	0.0068	0.0270	0.0113	0.0907

Example MSAT Descriptive File

* #####
* Example Input File
* File 1, Run 1, Scenario 1.
* #####

Calendar Year: 2002										
Month: Jan.										
Market Weighted Oxygen Level: 3.053 wt%										
Gasoline Fuel Sulfur Content: 279 ppm										
Maximum Temperature: 84.0 F										
Minimum Temperature: 68.0 F										
Weathered RVP: 7.0 psi										
E200: 50.00 %										
E300: 85.00 %										
Aromatics: 25.00 vol %										
Olefins: 15.00 vol %										
Benzene: 1.50 vol %										
MTBE: 15.10 vol % (market fraction: 0.500)										
ETBE: 17.60 vol % (market fraction: 0.050)										
Ethanol: 10.00 vol % (market fraction: 0.450)										
TAME: 6.00 vol % (market fraction: 0.000)										
Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4638	0.3052	0.1042		0.0357	0.0008	0.0017	0.0827	0.0060	1.0000
Exhaust Emission Factors (mg/mi):										
Benzene:	45.46	56.35	79.18	62.16	36.94	14.67	19.80	7.78	56.15	48.874
MTBE:	14.14	17.05	30.08	20.36	9.94	0.00	0.00	0.00	29.46	15.426
1,3 Butadiene:	5.09	6.04	11.67	7.48	5.80	6.60	8.91	4.52	18.51	6.133
Formaldehyde:	11.55	18.19	35.19	22.52	36.17	28.32	38.21	57.95	50.28	21.044
Acetaldehyde:	6.36	8.73	15.16	10.37	10.67	9.02	12.18	21.34	17.78	9.475
Acrolein:	0.46	0.62	1.01	0.72	3.42	2.57	3.46	2.59	1.06	0.859

Example MSAT Descriptive File (continued)

Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4638	0.3052	0.1042		0.0357	0.0008	0.0017	0.0827	0.0060	1.0000
Evaporative Emission Factors (mg/ml):										
Benzene Hot Soak :	1.84	1.40	2.26	1.62	2.49	0.00	0.00	0.00	1.27	1.613
Benzene Diurnal :	0.21	0.20	0.34	0.24	0.39	0.00	0.00	0.00	0.06	0.208
Benzene Running :	3.07	2.46	3.22	2.65	3.44	0.00	0.00	0.00	0.00	2.630
Benzene Resting :	1.39	1.30	2.25	1.54	2.79	0.00	0.00	0.00	4.14	1.402
Benzene Refueling :	1.03	1.75	2.46	1.93	3.74	0.00	0.00	0.00	0.00	1.399
Benzene Total Evp:	7.54	7.10	10.52	7.97	12.86	0.00	0.00	0.00	5.48	7.252
MTBE Hot Soak :	14.30	10.84	17.53	12.55	19.29	0.00	0.00	0.00	9.89	12.517
MTBE Diurnal :	1.45	1.39	2.36	1.63	2.72	0.00	0.00	0.00	0.43	1.442
MTBE Running :	12.39	9.92	13.01	10.71	13.92	0.00	0.00	0.00	0.00	10.627
MTBE Resting :	9.66	9.02	15.59	10.69	19.35	0.00	0.00	0.00	28.73	9.722
MTBE Refueling :	9.00	15.29	21.51	16.87	32.79	0.00	0.00	0.00	0.00	12.250
MTBE Total Evp:	46.80	46.46	70.00	52.45	88.07	0.00	0.00	0.00	39.05	46.559
Exhaust + Evaporative Emission Factors (mg/ml):										
Benzene Exh + Evp:	53.00	63.45	89.70	70.13	49.79	14.67	19.80	7.78	61.63	56.126
MTBE Exh + Evp:	60.94	63.51	100.08	72.82	98.00	0.00	0.00	0.00	68.51	61.985

External Conditions

Calendar Year of Evaluation

Month of Evaluation

Altitude

Temperature

Humidity

Other Air Conditioning Related Input Options

- Rely on MOBILE6.2 Defaults

Calendar Years of Evaluation

Evaluate a planned project with respect to:

- A base year representing current conditions
- Estimated time of completion
- Design year

CALENDAR YEAR : 2005

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Years 1952 to 2051, inclusive

Month of Evaluation

Historically, EPA's MOBILE models were designed for predicting episodic emission events of ozone in the summer and carbon monoxide in the winter

EVALUATION MONTH : 1

Optional Command	Default Value = 1	Scenario Section
------------------	-------------------	------------------

Choice of 1 for January; or 7 for July

- Accounts for the replacement of older vehicles with new vehicles during the calendar year, i.e., fleet turnover
- Applies winter or summer RFG rules
- Independent of parameters such as temperature, humidity, fuel volatility, etc.

Month of Evaluation (continued)

Recent guidance issued for annual particulate matter

Annual PM and MSAT emission estimates can be made from:

- A single scenario representing annual average conditions
- Multiple scenarios employing mathematical interpolation between January and July and totaling the results

Other interpolation options:

- Winter / Summer – 2 scenarios
- Winter / Summer / Winter – 3 scenarios
- Winter / Spring / Summer / Fall – 4 scenarios
- Monthly – 12 scenarios

Month of Evaluation (continued)

EPA's Simplified Interpolation Scheme

Month		EVALUATION MONTH	CALENDAR YEAR
January	1	1	Current Year
February	2	1	Current Year
March	3	1	Current Year
April	4	7	Current Year
May	5	7	Current Year
June	6	7	Current Year
July	7	7	Current Year
August	8	7	Current Year
September	9	7	Current Year
October	10	1	Current Year + 1
November	11	1	Current Year + 1
December	12	1	Current Year + 1

Altitude

Chose low or high altitude as appropriate for the application area

Methods for assigning values

- Those areas designated by EPA as high altitude are provided in 40 CFR 86.091-30 (a)(5)(ii) and (iv)

Altitude (continued)

ALTITUDE : 1

Optional Command	Default Value = 1	Scenario Section
------------------	-------------------	------------------

Choice of 1 for low altitude; or 2 for high altitude

- Low altitude representative of ≈ 500 ft above mean sea level
- High altitude representative of $\approx 5,500$ ft above mean sea level
- MOBILE6.2 includes vehicles built to meet specific high altitude emission standards

Temperature

Use minimum and maximum daily temperatures consistent with SIP and conformity applications, as relevant

Methods for assigning values

- Specify a single temperature as the minimum and maximum temperature to model the worst-case hour at the project level
- For a CO episode, use the average temperature corresponding to the 10 highest CO monitoring values for the last 3 years

Temperature (continued)

Methods for assigning values

- For an average winter CO day
 - Use the local average of the daily minimum and maximum temperatures January
 - Use the local average min/max temperatures most representative of the 3-month season for CO (Dec – Feb)
- For annual PM and MSATs, use the average of the daily minimum and maximum temperatures for the year, by season, or by month
- The National Climatic Data Center compiles weather data collected across the nation and provides a summary of normal daily minimum and maximum temperatures by month by location

Temperature (continued)

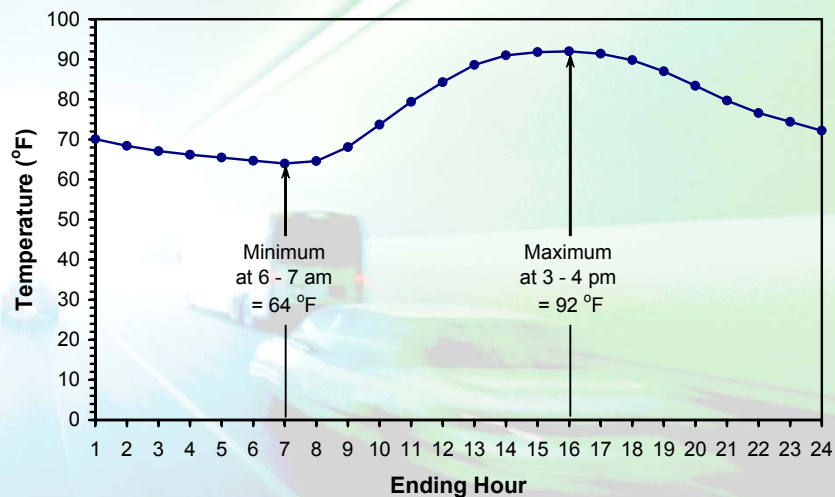
MIN/MAX TEMP : 64.0 92.0

Required Command	No Default Values	Run or Scenario Section
------------------	-------------------	-------------------------

Minimum and maximum daily temperatures in °F

- Minimum temperature (0 °F – 100 °F, inclusive) assumed to occur at 6 am
- Maximum temperature (20 °F – 120 °F, inclusive) assumed to occur at 3 pm
- 24-hour profile created using mathematical interpolation
- Used in temperature correction factors and evaporation calculations

24-Hour Temperature Profile



Humidity

Use local humidity consistent with SIP and conformity applications, as relevant

Methods for assigning values

- Average humidity ratio for the year, by season, or by month
- Ensure that the humidity ratio (considering the temperature variability over the day) equates to a relative humidity value of no more than 100%
- Measurements of relative humidity and barometric pressure taken at 3-hour intervals compiled by the National Climatic Data Center

Humidity (continued)

ABSOLUTE HUMIDITY : 75.0

Optional Command	Default Value = 75 grains/lb	Run or Scenario Section
------------------	---------------------------------	----------------------------

Daily average absolute humidity or humidity ratio in grains/lb

- 20 – 528 gr/lb, inclusive
- Affects air conditioning use, which increases exhaust emissions. Limited applicability for wintertime CO events.
- Relative humidity and barometric pressure can now be used as an alternative to absolute humidity

Vehicle Fleet Characteristics

Age Distribution of Vehicle Registrations

Annual Mileage Accumulation Rates

- Rely on MOBILE6.2 defaults

Diesel Fractions

- Rely on MOBILE6.2 defaults

Age Distribution of Vehicle Registrations

Use locally-derived age distributions for all vehicle classes

- Local registration age distributions should not change across calendar years

EPA Estimation Methods

- “Techniques for Estimating MOBILE2 Variables”
- “Additional Techniques for Estimating MOBILE2 Variables”
- Chapter 1 – “Preferred and Alternative Methods for Gathering and Locating Specific Emission Inventory Data” of Volume IV – “Mobile Sources” of the Emission Inventory Improvement Program

Age Distribution of Vehicle Registrations (continued)

REG DIST : REGDATA.D

Optional Command	Default File = REGDATA.D	Run Section
------------------	-----------------------------	-------------

Vehicle registration fractions by 25 model years for one or more of 16 composite types

- Each value should range from 0 – 1
- Sum of the 25 model year values must equal 1.0

National default registration distribution found in the external file: REGDATA.D

REGDATA.D

REG DIST

*

* This file contains the default MOBILE6 values for the distribution of
* vehicles by age for July of any calendar year. There are sixteen (16)
* sets of values representing 16 combined gasoline/diesel vehicle class
* distributions. These distributions are split for gasoline and diesel
* using the separate input (or default) values for diesel sales fractions.
* Each distribution contains 25 values which represent the fraction of
* all vehicles in that class (gasoline and diesel) of that age in July.
* The first number is for age 1 (calendar year minus model year plus one)
* and the last number is for age 25. The last age includes all vehicles
* of age 25 or older. The first number in each distribution is an integer
* which indicates which of the 16 vehicle classes are represented by the
* distribution. The sixteen vehicle classes are:

*

- * 1 LDV Light-Duty Vehicles (Passenger Cars)
- * 2 LDT1 Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
- * 3 LDT2 Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
- * 4 LDT3 Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
- * 5 LDT4 Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
- * 6 HDV2B Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)
- * 7 HDV3 Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)
- * 8 HDV4 Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)
- * 9 HDV5 Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)

REGDATA.D

* 10 HDV6 Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)
 * 11 HDV7 Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)
 * 12 HDV8A Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)
 * 13 HDV8B Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)
 * 14 HDBS School Busses
 * 15 HDBT Transit and Urban Busses
 * 16 MC Motorcycles (All)
 *
 * The 25 age values are arranged in two rows of 10 values followed by a row
 * with the last 5 values. Comments (such as this one) are indicated by
 * an asterisk in the first column. Empty rows are ignored. Values are
 * read "free format," meaning any number may appear in any row with as
 * many characters as needed (including a decimal) as long as 25 values
 * follow the initial integer value separated by a space.
 *
 * If all 28 vehicle classes do not need to be altered from the default
 * values, then only the vehicle classes that need to be changed need to
 * be included in this file. The order in which the vehicle classes are
 * read does not matter, however each vehicle class set must contain 25
 * values and be in the proper age order.
 *

REGDATA.D

* LDV
 1 0.0530 0.0706 0.0706 0.0705 0.0703 0.0698 0.0689 0.0676 0.0655 0.0627
 0.0588 0.0539 0.0458 0.0363 0.0288 0.0228 0.0181 0.0144 0.0114 0.0090
 0.0072 0.0057 0.0045 0.0036 0.0102
 * LDT1
 2 0.0581 0.0774 0.0769 0.0760 0.0745 0.0723 0.0693 0.0656 0.0610 0.0557
 0.0498 0.0436 0.0372 0.0309 0.0249 0.0195 0.0147 0.0107 0.0085 0.0081
 0.0078 0.0075 0.0072 0.0069 0.0359
 * LDT2
 3 0.0581 0.0774 0.0769 0.0760 0.0745 0.0723 0.0693 0.0656 0.0610 0.0557
 0.0498 0.0436 0.0372 0.0309 0.0249 0.0195 0.0147 0.0107 0.0085 0.0081
 0.0078 0.0075 0.0072 0.0069 0.0359
 * LDT3
 4 0.0594 0.0738 0.0688 0.0640 0.0597 0.0556 0.0518 0.0482 0.0449 0.0419
 0.0390 0.0363 0.0338 0.0315 0.0294 0.0274 0.0255 0.0237 0.0221 0.0206
 0.0192 0.0179 0.0167 0.0156 0.0732
 * LDT4
 5 0.0594 0.0738 0.0688 0.0640 0.0597 0.0556 0.0518 0.0482 0.0449 0.0419
 0.0390 0.0363 0.0338 0.0315 0.0294 0.0274 0.0255 0.0237 0.0221 0.0206
 0.0192 0.0179 0.0167 0.0156 0.0732
 * HDV2B
 6 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
 0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
 0.0152 0.0138 0.0126 0.0114 0.0499

REGDATA.D

* HDV3

7 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
0.0152 0.0138 0.0126 0.0114 0.0499

* HDV4

8 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

* HDV5

9 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

* HDV6

10 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

* HDV7

11 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

* HDV8a

12 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

REGDATA.D

* HDV8b

13 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797

* HDBS

14 0.0393 0.0734 0.0686 0.0641 0.0599 0.0559 0.0522 0.0488 0.0456 0.0426
0.0398 0.0372 0.0347 0.0324 0.0303 0.0283 0.0264 0.0247 0.0231 0.0216
0.0201 0.0188 0.0176 0.0165 0.0781

* HDBT

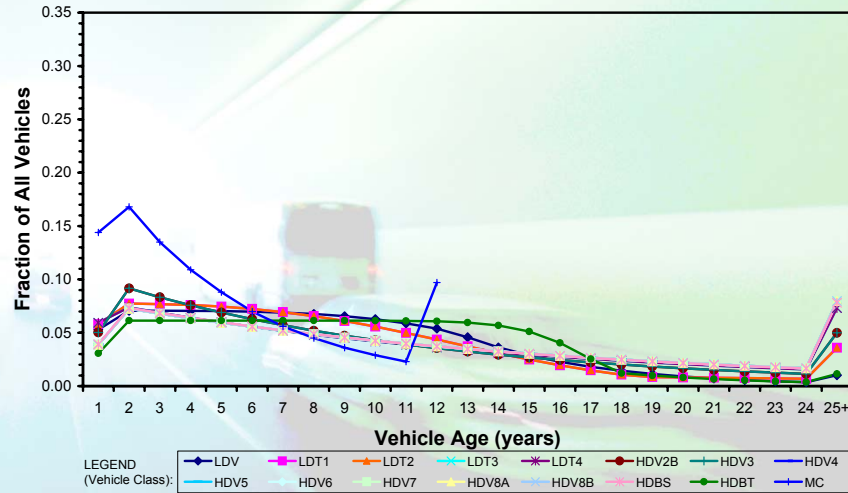
15 0.0307 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0613
0.0611 0.0607 0.0595 0.0568 0.0511 0.0406 0.0254 0.0121 0.0099 0.0081
0.0066 0.0054 0.0044 0.0037 0.0114

* Motorcycles

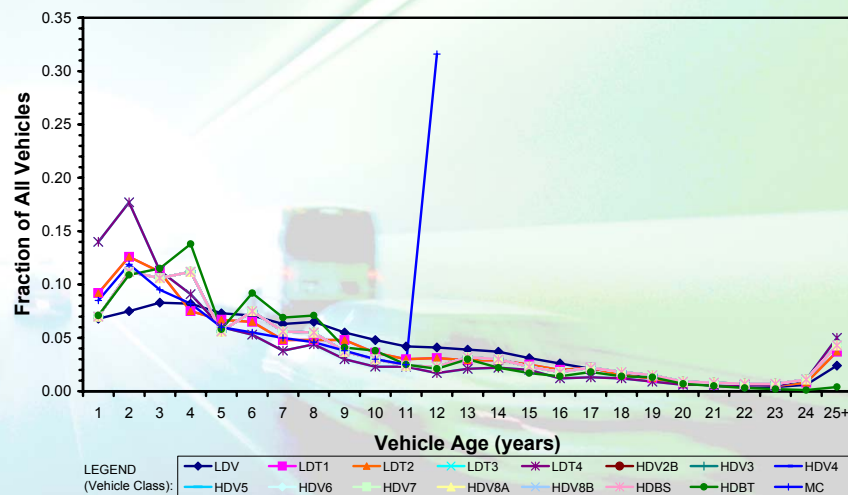
16 0.1440 0.1680 0.1350 0.1090 0.0880 0.0700 0.0560 0.0450 0.0360 0.0290
0.0230 0.0970 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000

MOBILE6.2 National Default Registration Distribution

Based on U.S. vehicle fleet as of July 1, 1996



MOBILE6.2 Registration Distribution for Las Vegas, NV



Vehicle Activity

VTM Fraction by Vehicle Class

VTM Fraction by Highway Functional System

VTM Fraction by Hour of the Day

VTM Fraction by Average Speed

Average Speed

Vehicle Activity (continued)

Vehicle Engine Starts per Day

- Use zero starts per day for most applications

Vehicle Engine Starts by Hour of the Day

- Rely on MOBILE6.2 defaults

Vehicle Soak Time Between Engine Starts

- Rely on MOBILE6.2 defaults

Vehicle Activity (continued)

Vehicle Soak Time After Engine Shut Down

- Rely on MOBILE6.2 defaults

Vehicle Diurnal Soak Time

- Rely on MOBILE6.2 defaults

Vehicle Trip Length Distribution

- Rely on MOBILE6.2 defaults

VMT Fraction by Vehicle Class

Use locally-derived VMT fractions by vehicle class

EPA Estimation Methods

- “Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation”
- “User’s Guide to MOBILE6.1 and MOBILE6.2, Mobile Source Emission Factor Model”
- Chapter 2 – “Use of Locality-Specific Transportation Data for the Development of Mobile Source Emission Inventories” of Volume IV – “Mobile Sources” of the Emission Inventory Improvement Program

VMT Fraction by Vehicle Class (continued)

VMT FRACTIONS :

0.354 0.089 0.297 0.092 0.041 0.040 0.004 0.003
0.002 0.008 0.010 0.012 0.040 0.002 0.001 0.005

Optional Command	Default Values in Technical Guide	Run or Scenario Section
------------------	--------------------------------------	----------------------------

Fraction of total highway vehicle-miles traveled (VMT) by 16 composite vehicle types

- Each value should range from 0 – 1
- Sum of the 16 values must equal 1.0

VMT Fraction by Vehicle Class (continued)

VMT fraction by vehicle class may vary substantially by time, which is not explicitly handled in MOBILE6.2

For PM and MSATS, an appropriately weighted distribution representative of a typical day, a specific month or season, or annual vehicle mix should be specified

Table 4.1.2 – MOBILE6.2 Technical Guidance

Cal Yr	LDV	LDT1	LDT2	LDT3	LDT4	HDV2B	HDV3	HDV4
52 - 72	0.6833	0.0374	0.1245	0.0517	0.0237	0.0238	0.0021	0.0013
1973	0.6833	0.0374	0.1245	0.0517	0.0237	0.0238	0.0021	0.0013
1974	0.6833	0.0374	0.1245	0.0517	0.0237	0.0238	0.0021	0.0013
1975	0.6833	0.0374	0.1245	0.0517	0.0237	0.0238	0.0021	0.0013
1976	0.6834	0.0373	0.1243	0.0517	0.0238	0.0238	0.0021	0.0013
1977	0.6839	0.0372	0.1238	0.0517	0.0238	0.0238	0.0021	0.0013
1978	0.6843	0.0371	0.1234	0.0517	0.0238	0.0238	0.0021	0.0013
1979	0.6844	0.0370	0.1232	0.0517	0.0238	0.0238	0.0021	0.0013
1980	0.6843	0.0370	0.1231	0.0517	0.0238	0.0238	0.0021	0.0013
1981	0.6841	0.0370	0.1230	0.0517	0.0238	0.0238	0.0021	0.0013
1982	0.6837	0.0370	0.1231	0.0517	0.0238	0.0238	0.0021	0.0013
1983	0.6813	0.0367	0.1222	0.0517	0.0238	0.0251	0.0023	0.0014
1984	0.6764	0.0365	0.1216	0.0520	0.0239	0.0270	0.0025	0.0015
1985	0.6695	0.0369	0.1228	0.0520	0.0239	0.0290	0.0027	0.0016
1986	0.6621	0.0377	0.1255	0.0524	0.0241	0.0302	0.0029	0.0017
1987	0.6548	0.0387	0.1287	0.0533	0.0245	0.0309	0.0031	0.0017
1988	0.6460	0.0396	0.1317	0.0548	0.0252	0.0317	0.0032	0.0018
1989	0.6357	0.0408	0.1358	0.0565	0.0260	0.0325	0.0033	0.0019
1990	0.6284	0.0420	0.1397	0.0566	0.0260	0.0332	0.0034	0.0020
1991	0.6212	0.0435	0.1448	0.0560	0.0257	0.0336	0.0035	0.0021
1992	0.6109	0.0456	0.1518	0.0555	0.0255	0.0342	0.0036	0.0022
1993	0.6009	0.0477	0.1587	0.0551	0.0253	0.0348	0.0036	0.0023
1994	0.5910	0.0497	0.1655	0.0546	0.0251	0.0354	0.0037	0.0024
1995	0.5815	0.0517	0.1721	0.0542	0.0249	0.0358	0.0037	0.0025
1996	0.5721	0.0534	0.1776	0.0547	0.0252	0.0362	0.0037	0.0025

Table 4.1.2 – MOBILE6.2 Technical Guidance

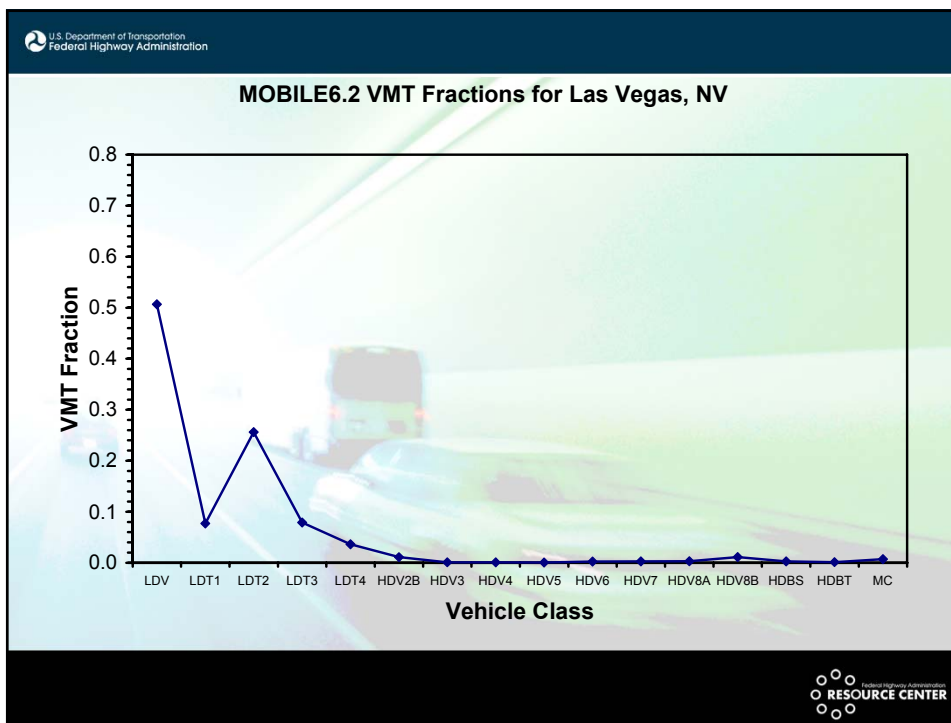
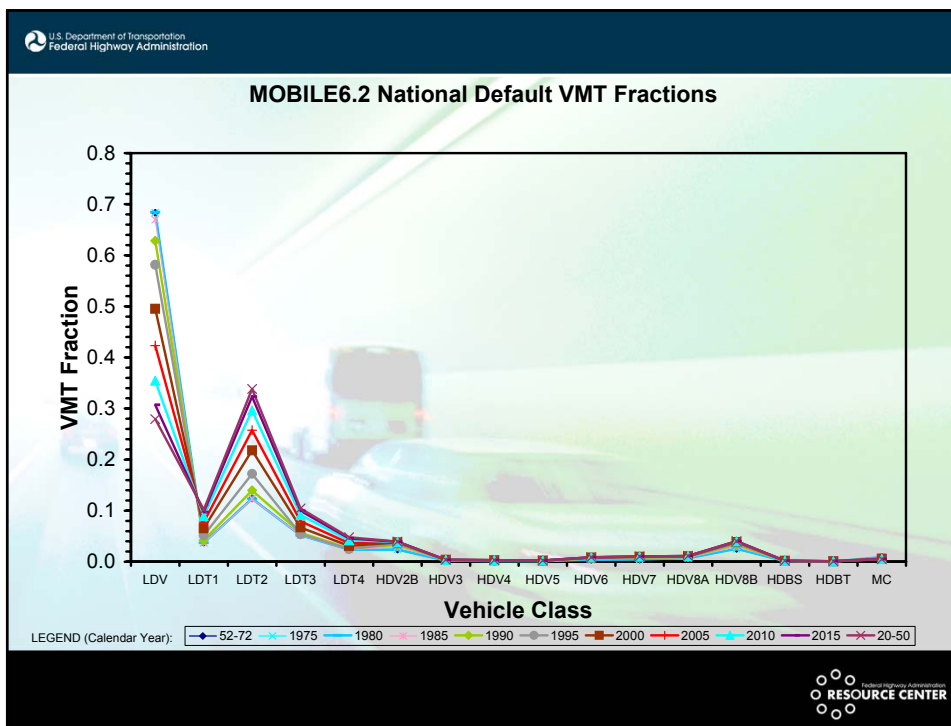
Cal Yr	LDV	LDT1	LDT2	LDT3	LDT4	HDV2B	HDV3	HDV4
1997	0.5569	0.0557	0.1853	0.0571	0.0263	0.0367	0.0037	0.0026
1998	0.5360	0.0590	0.1963	0.0605	0.0278	0.0372	0.0038	0.0027
1999	0.5153	0.0622	0.2071	0.0638	0.0294	0.0377	0.0038	0.0028
2000	0.4953	0.0655	0.2179	0.0672	0.0309	0.0380	0.0038	0.0029
2001	0.4785	0.0683	0.2273	0.0700	0.0322	0.0381	0.0038	0.0029
2002	0.4646	0.0706	0.2349	0.0724	0.0333	0.0382	0.0038	0.0030
2003	0.4507	0.0729	0.2425	0.0748	0.0344	0.0384	0.0038	0.0030
2004	0.4365	0.0752	0.2503	0.0771	0.0355	0.0386	0.0038	0.0030
2005	0.4231	0.0774	0.2577	0.0794	0.0365	0.0387	0.0038	0.0031
2006	0.4096	0.0797	0.2654	0.0818	0.0376	0.0387	0.0038	0.0031
2007	0.3952	0.0822	0.2735	0.0843	0.0388	0.0387	0.0038	0.0031
2008	0.3807	0.0846	0.2817	0.0868	0.0399	0.0388	0.0038	0.0031
2009	0.3669	0.0869	0.2894	0.0892	0.0410	0.0389	0.0038	0.0032
2010	0.3544	0.0891	0.2965	0.0914	0.0420	0.0390	0.0038	0.0032
2011	0.3428	0.0911	0.3031	0.0934	0.0430	0.0390	0.0038	0.0032
2012	0.3325	0.0928	0.3090	0.0952	0.0438	0.0390	0.0038	0.0032
2013	0.3231	0.0944	0.3143	0.0969	0.0445	0.0390	0.0038	0.0032
2014	0.3145	0.0959	0.3191	0.0983	0.0452	0.0391	0.0038	0.0032
2015	0.3071	0.0971	0.3233	0.0996	0.0458	0.0391	0.0039	0.0032
2016	0.3004	0.0982	0.3270	0.1008	0.0463	0.0392	0.0039	0.0033
2017	0.2944	0.0992	0.3304	0.1018	0.0468	0.0392	0.0039	0.0033
2018	0.2892	0.1001	0.3332	0.1027	0.0472	0.0393	0.0039	0.0033
2019	0.2846	0.1008	0.3357	0.1035	0.0476	0.0394	0.0039	0.0033
20 - 50	0.2793	0.1017	0.3384	0.1043	0.0480	0.0396	0.0039	0.0033

Table 4.1.2 – MOBILE6.2 Technical Guidance

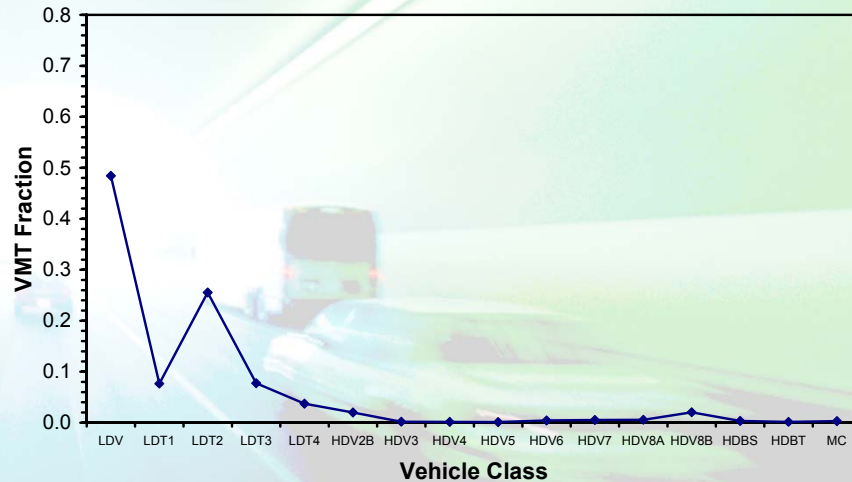
Cal Yr	HDV5	HDV6	HDV7	HDV8A	HDV8B	HDBS	HDBT	MC
52 - 72	0.0012	0.0038	0.0042	0.0069	0.0252	0.0012	0.0006	0.0092
1973	0.0012	0.0038	0.0042	0.0069	0.0252	0.0012	0.0006	0.0092
1974	0.0012	0.0038	0.0042	0.0069	0.0252	0.0012	0.0006	0.0092
1975	0.0012	0.0038	0.0042	0.0069	0.0252	0.0012	0.0006	0.0092
1976	0.0012	0.0038	0.0042	0.0070	0.0252	0.0012	0.0006	0.0092
1977	0.0012	0.0038	0.0042	0.0070	0.0252	0.0012	0.0006	0.0092
1978	0.0012	0.0038	0.0043	0.0070	0.0252	0.0012	0.0006	0.0092
1979	0.0012	0.0039	0.0044	0.0070	0.0252	0.0013	0.0006	0.0092
1980	0.0012	0.0039	0.0046	0.0070	0.0252	0.0012	0.0006	0.0092
1981	0.0012	0.0040	0.0048	0.0070	0.0252	0.0013	0.0006	0.0092
1982	0.0012	0.0042	0.0050	0.0070	0.0252	0.0012	0.0006	0.0092
1983	0.0012	0.0045	0.0054	0.0073	0.0262	0.0013	0.0006	0.0091
1984	0.0013	0.0049	0.0059	0.0078	0.0279	0.0014	0.0007	0.0088
1985	0.0014	0.0053	0.0064	0.0083	0.0296	0.0015	0.0007	0.0085
1986	0.0015	0.0056	0.0068	0.0086	0.0307	0.0015	0.0007	0.0082
1987	0.0015	0.0058	0.0070	0.0088	0.0313	0.0015	0.0007	0.0079
1988	0.0015	0.0060	0.0074	0.0090	0.0321	0.0016	0.0008	0.0077
1989	0.0016	0.0062	0.0076	0.0092	0.0329	0.0016	0.0008	0.0075
1990	0.0016	0.0064	0.0079	0.0094	0.0337	0.0017	0.0008	0.0073
1991	0.0017	0.0066	0.0081	0.0095	0.0341	0.0017	0.0008	0.0072
1992	0.0017	0.0068	0.0083	0.0097	0.0346	0.0017	0.0008	0.0071
1993	0.0018	0.0070	0.0085	0.0098	0.0350	0.0017	0.0008	0.0070
1994	0.0018	0.0072	0.0087	0.0100	0.0355	0.0018	0.0008	0.0070
1995	0.0019	0.0073	0.0089	0.0101	0.0360	0.0018	0.0009	0.0069
1996	0.0019	0.0075	0.0090	0.0102	0.0364	0.0018	0.0009	0.0068

Table 4.1.2 – MOBILE6.2 Technical Guidance

Cal Yr	HDV5	HDV6	HDV7	HDV8A	HDV8B	HDBS	HDBT	MC
1997	0.0020	0.0077	0.0092	0.0104	0.0370	0.0018	0.0009	0.0067
1998	0.0021	0.0079	0.0095	0.0106	0.0376	0.0019	0.0009	0.0065
1999	0.0021	0.0081	0.0097	0.0107	0.0382	0.0019	0.0009	0.0064
2000	0.0022	0.0082	0.0098	0.0108	0.0386	0.0019	0.0009	0.0062
2001	0.0022	0.0083	0.0099	0.0109	0.0388	0.0019	0.0009	0.0061
2002	0.0022	0.0084	0.0100	0.0109	0.0390	0.0019	0.0009	0.0060
2003	0.0023	0.0085	0.0100	0.0110	0.0392	0.0019	0.0009	0.0059
2004	0.0023	0.0085	0.0101	0.0111	0.0394	0.0019	0.0009	0.0058
2005	0.0023	0.0086	0.0102	0.0111	0.0395	0.0020	0.0009	0.0057
2006	0.0023	0.0086	0.0102	0.0111	0.0396	0.0020	0.0009	0.0056
2007	0.0023	0.0086	0.0102	0.0111	0.0396	0.0020	0.0009	0.0056
2008	0.0024	0.0087	0.0102	0.0111	0.0397	0.0020	0.0009	0.0055
2009	0.0024	0.0087	0.0103	0.0112	0.0398	0.0020	0.0010	0.0054
2010	0.0024	0.0087	0.0103	0.0112	0.0399	0.0020	0.0010	0.0054
2011	0.0024	0.0087	0.0103	0.0112	0.0398	0.0020	0.0010	0.0053
2012	0.0024	0.0087	0.0103	0.0112	0.0399	0.0020	0.0010	0.0053
2013	0.0024	0.0087	0.0103	0.0112	0.0399	0.0020	0.0010	0.0053
2014	0.0024	0.0088	0.0103	0.0112	0.0400	0.0020	0.0010	0.0052
2015	0.0024	0.0088	0.0104	0.0112	0.0400	0.0020	0.0010	0.0052
2016	0.0024	0.0088	0.0104	0.0112	0.0400	0.0020	0.0010	0.0052
2017	0.0024	0.0088	0.0104	0.0113	0.0401	0.0020	0.0010	0.0051
2018	0.0024	0.0088	0.0104	0.0113	0.0402	0.0020	0.0010	0.0051
2019	0.0025	0.0088	0.0104	0.0113	0.0403	0.0020	0.0010	0.0051
20 - 50	0.0025	0.0089	0.0105	0.0114	0.0405	0.0020	0.0010	0.0051



MOBILE6.2 VMT Fractions for Denver, CO



VMT Fraction by Highway Functional System

Use locally-derived VMT fractions by highway functional system

Most applicable to a project-level MSAT analysis

Identify an affected transportation network consisting of all project links plus those links where AADT is expected to change by $\pm 5\%$ or more as a result of the proposed project

VMT Fraction by Highway Functional System

EPA Estimation Methods

- “Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation”
- “Guidance for the Development of Facility Type VMT and Speed Distributions”
- “Development of Methodology for Estimating VMT Weighting by Facility Type”

VMT Fraction by Highway Functional System (continued)

VMT BY FACILITY : FVMT.DEF

Optional Command	Default File = FVMT.DEF	Run or Scenario Section
------------------	----------------------------	----------------------------

Fraction of total highway VMT for one or more of 28 vehicle classes across 4 facility types for 24 hours

- Each value should range from 0 – 1
- The distribution for each hour must sum to 1.0
- Generally used in conjunction with the SPEED VMT command

National default VMT distribution by highway type found in the external file: FVMT.DEF

FVMT.DEF

VMT BY FACILITY

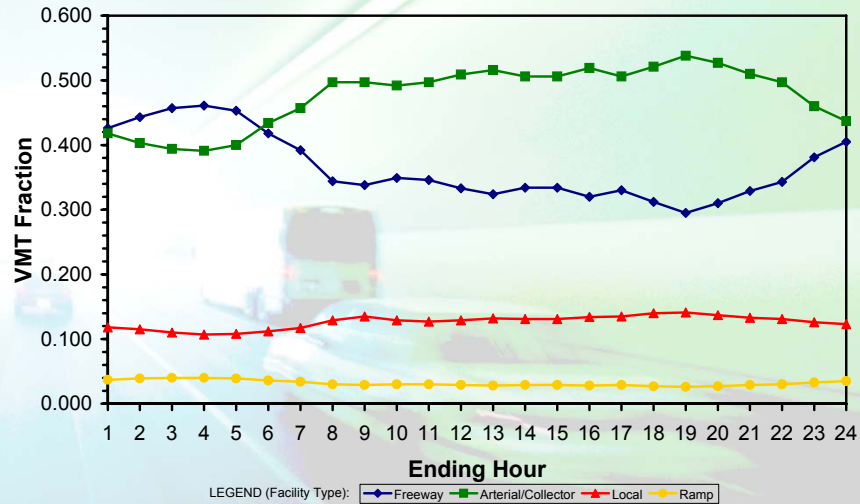
- * VMT fractions are listed for 28 vehicle classes.
- * For each class, 24 sets of values represent the hours of the day.
- * For each class and hour, 4 values represent the VMT distribution on freeway, arterial, local and ramps--in that order.

1	0.392	0.457	0.117	0.034
	0.344	0.497	0.129	0.030
	0.338	0.497	0.135	0.029
	0.349	0.492	0.129	0.030
	0.346	0.497	0.127	0.030
	0.333	0.509	0.129	0.029
	0.324	0.516	0.132	0.028
	0.334	0.506	0.131	0.029
	0.334	0.506	0.131	0.029
	0.320	0.519	0.134	0.028
	0.330	0.506	0.135	0.029
	0.312	0.521	0.140	0.027
	0.295	0.538	0.141	0.026
	0.310	0.527	0.137	0.027
	0.329	0.510	0.133	0.029
	0.343	0.497	0.131	0.030
	0.381	0.460	0.126	0.033
	0.405	0.437	0.123	0.035
	0.426	0.418	0.118	0.037
	0.443	0.403	0.115	0.039
	0.457	0.394	0.110	0.040
	0.461	0.391	0.107	0.040
	0.453	0.400	0.108	0.039
	0.418	0.434	0.112	0.036

FVMT.DEF

28	0.392	0.457	0.117	0.034
	0.344	0.497	0.129	0.030
	0.338	0.497	0.135	0.029
	0.349	0.492	0.129	0.030
	0.346	0.497	0.127	0.030
	0.333	0.509	0.129	0.029
	0.324	0.516	0.132	0.028
	0.334	0.506	0.131	0.029
	0.334	0.506	0.131	0.029
	0.320	0.519	0.134	0.028
	0.330	0.506	0.135	0.029
	0.312	0.521	0.140	0.027
	0.295	0.538	0.141	0.026
	0.310	0.527	0.137	0.027
	0.329	0.510	0.133	0.029
	0.343	0.497	0.131	0.030
	0.381	0.460	0.126	0.033
	0.405	0.437	0.123	0.035
	0.426	0.418	0.118	0.037
	0.443	0.403	0.115	0.039
	0.457	0.394	0.110	0.040
	0.461	0.391	0.107	0.040
	0.453	0.400	0.108	0.039
	0.418	0.434	0.112	0.036

MOBILE6.2 National Default VMT by Facility



VMT Fraction Hour of the Day

Rely on the national default values built into MOBILE6.2

- Use project-developed VMT fractions by hour of the day, if available

VMT BY HOUR : HVMT. DEF

Optional Command

Default File =
HVMT.DEF

Run or Scenario
Section

Fraction of total highway VMT across 24 hours

- Each value should range from 0 – 1
- Sum of 24 hourly values must equal 1.0

VMT Fraction Hour of the Day (continued)

National default hourly VMT distribution found in the external
file: HVMT.DEF

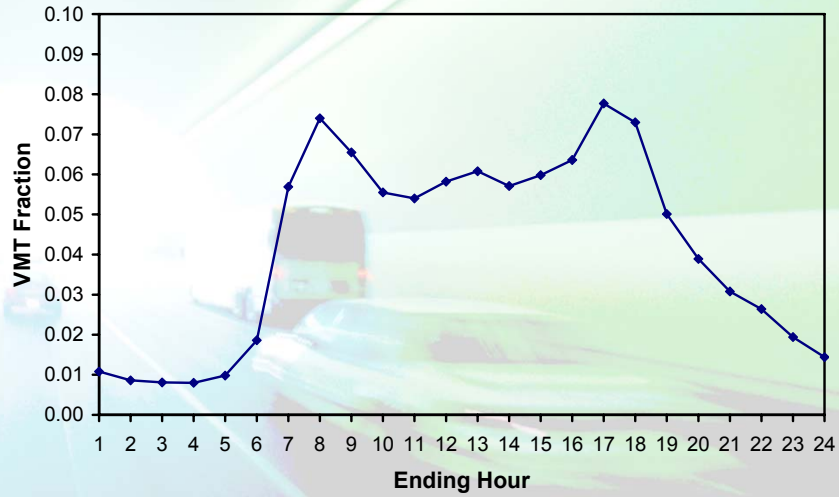
HVMT.DEF

VMT BY HOUR

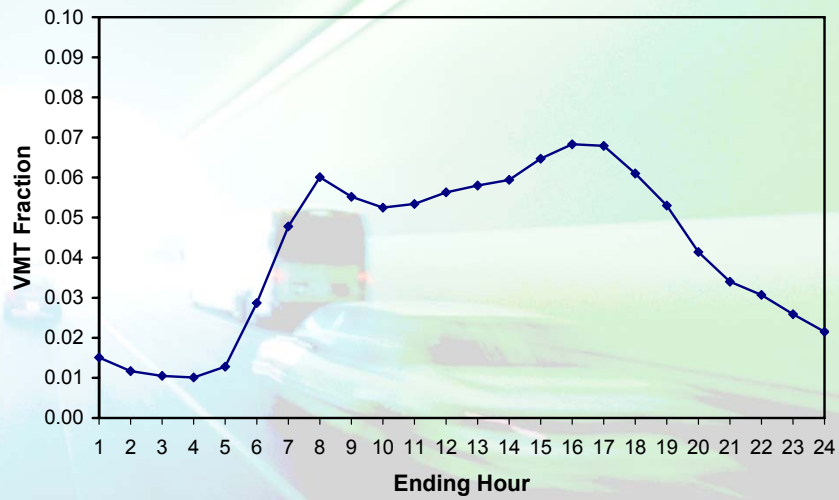
- * Fraction of all vehicle miles traveled by hour of the day.
- * First hour is 6 a.m.

0.0569	0.0740	0.0655	0.0555	0.0540	0.0582
0.0608	0.0571	0.0598	0.0636	0.0777	0.0730
0.0501	0.0389	0.0308	0.0264	0.0194	0.0144
0.0108	0.0086	0.0081	0.0080	0.0098	0.0186

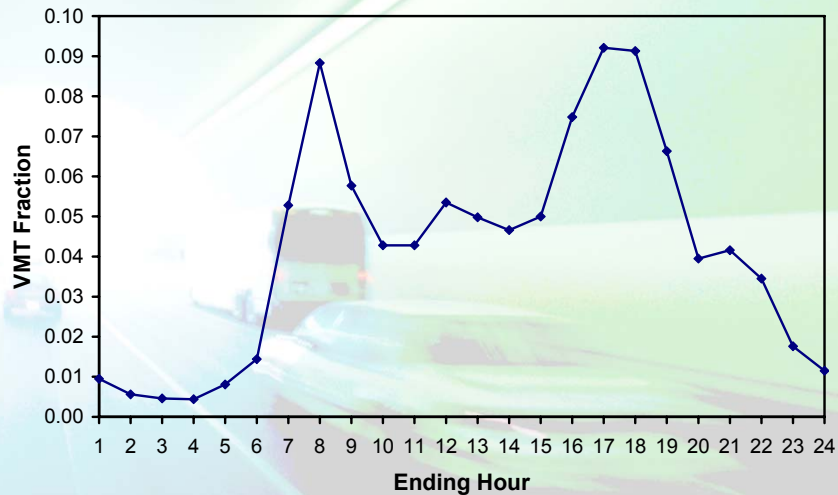
MOBILE6.2 National Default VMT by Hour



MOBILE6.2 VMT by Hour for Las Vegas, NV



MOBILE6.2 VMT by Hour for Denver, CO



Vehicle Speed

Two options for supplying vehicle speeds in MOBILE6:

- SPEED VMT command – distribution of VMT by average speed, for freeways and arterials, for 24 hours
- AVERAGE SPEED command – single speed for all hours; facility type must be specified

Typically, a look-up table of emission factors by link-specific speed is constructed to facilitate project-level air dispersion modeling and emission inventory analyses

A speed VMT distribution is a viable alternative for a project-level MSAT (emission inventory) analysis

VMT Fraction by Average Speed

Use locally-derived VMT fractions by average speed

- Refine by hour of day if the affected transportation network includes facilities operating close to and over capacity

EPA Estimation Methods

- Section 3.3 – “Speed Estimation Methods” of Chapter 2 – “Use of Locality-Specific Transportation Data for the Development of Mobile Source Emission Inventories” of Volume IV – “Mobile Sources” of the Emission Inventory Improvement Program

VMT Fraction by Average Speed (continued)

SPEED VMT : SVMT.DEF

Optional Command	Default File = SVMT.DEF	Run or Scenario Section
------------------	----------------------------	----------------------------

Aggregated VMT distribution of average speeds (14 pre-selected ranges) on freeway and arterial facilities by 24 hours

- Each value should range from 0 – 1
- The distribution for each hour must sum to 1.0
- Used in conjunction with the VMT BY FACILITY command
- Option to using the AVERAGE SPEED command

**National default speed VMT distribution found in the external file:
SVMT.DEF**

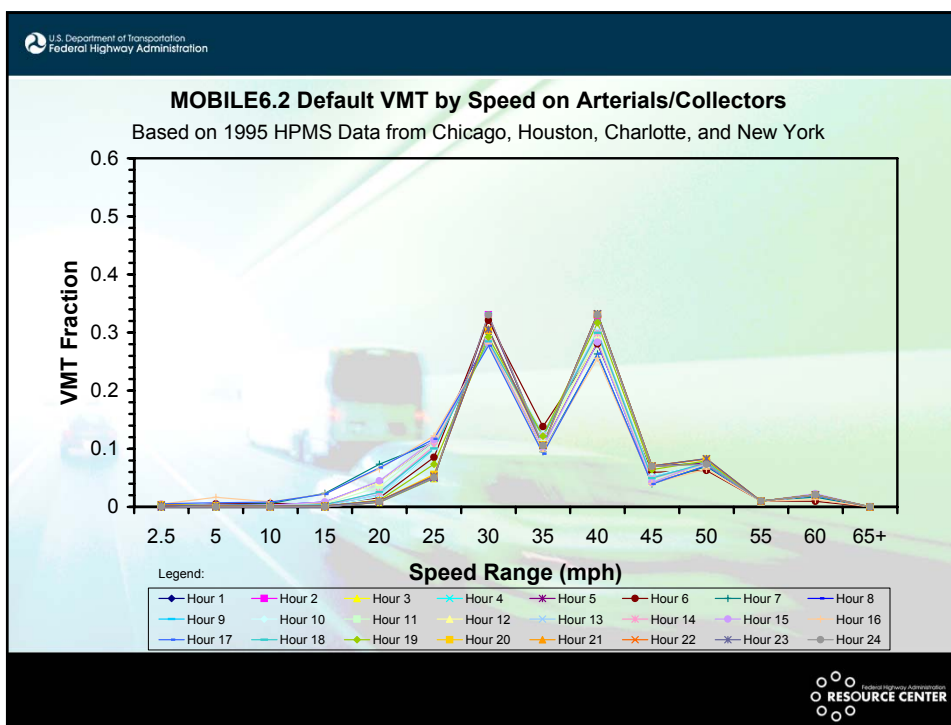
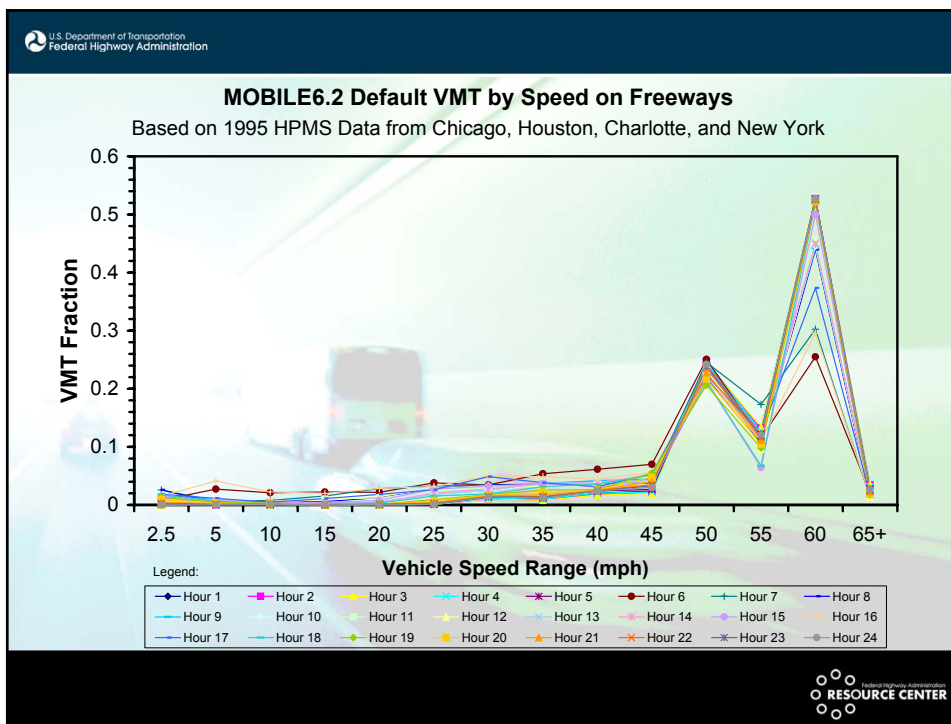
SVMT.DEF

SPEED VMT

1	1	0.0083	0.0272	0.0210	0.0224	0.0217	0.0381	0.0344	0.0536	0.0614	0.0700	0.2507	0.1150	0.2550	0.0212
1	2	0.0260	0.0066	0.0076	0.0156	0.0282	0.0326	0.0344	0.0361	0.0360	0.0435	0.2453	0.1729	0.3023	0.0129
1	3	0.0259	0.0033	0.0064	0.0057	0.0126	0.0281	0.0342	0.0349	0.0407	0.0369	0.2181	0.1066	0.4399	0.0127
1	4	0.0145	0.0096	0.0021	0.0022	0.0041	0.0166	0.0232	0.0373	0.0418	0.0449	0.2248	0.1190	0.4422	0.0177
1	5	0.0083	0.0086	0.0052	0.0032	0.0040	0.0163	0.0232	0.0364	0.0375	0.0420	0.2352	0.1170	0.4454	0.0177
1	6	0.0072	0.0034	0.0042	0.0098	0.0121	0.0244	0.0289	0.0327	0.0401	0.0392	0.2294	0.1011	0.4538	0.0137
1	7	0.0103	0.0023	0.0064	0.0087	0.0147	0.0281	0.0335	0.0328	0.0345	0.0354	0.2294	0.0964	0.4547	0.0128
1	8	0.0083	0.0075	0.0052	0.0043	0.0054	0.0182	0.0257	0.0381	0.0380	0.0421	0.2258	0.1118	0.4512	0.0184
1	9	0.0113	0.0065	0.0052	0.0023	0.0039	0.0206	0.0279	0.0358	0.0383	0.0517	0.2147	0.1151	0.4484	0.0183
1	10	0.0155	0.0075	0.0034	0.0042	0.0081	0.0272	0.0324	0.0363	0.0315	0.0390	0.2124	0.0644	0.5000	0.0181
1	11	0.0156	0.0411	0.0225	0.0199	0.0284	0.0316	0.0500	0.0488	0.0446	0.0555	0.2223	0.1092	0.2957	0.0148
1	12	0.0186	0.0113	0.0046	0.0110	0.0183	0.0261	0.0488	0.0383	0.0314	0.0534	0.2235	0.1237	0.3736	0.0174
1	13	0.0176	0.0064	0.0010	0.0024	0.0034	0.0155	0.0191	0.0315	0.0357	0.0515	0.2134	0.0674	0.5178	0.0173
1	14	0.0135	0.0043	0.0031	0.0010	0.0012	0.0094	0.0177	0.0258	0.0264	0.0550	0.2060	0.0980	0.5209	0.0177
1	15	0.0094	0.0031	0.0025	0.0007	0.0012	0.0069	0.0166	0.0216	0.0257	0.0476	0.2169	0.1048	0.5228	0.0202
1	16	0.0054	0.0018	0.0018	0.0004	0.0011	0.0045	0.0155	0.0175	0.0250	0.0401	0.2277	0.1117	0.5246	0.0229
1	17	0.0027	0.0010	0.0014	0.0002	0.0011	0.0028	0.0147	0.0147	0.0245	0.0352	0.2350	0.1162	0.5259	0.0246
1	18	0.0013	0.0006	0.0012	0.0001	0.0011	0.0020	0.0144	0.0133	0.0242	0.0327	0.2386	0.1185	0.5265	0.0255
1	19	0.0000	0.0001	0.0010	0.0000	0.0011	0.0012	0.0140	0.0119	0.0240	0.0302	0.2422	0.1208	0.5271	0.0264
1	20	0.0000	0.0013	0.0000	0.0000	0.0000	0.0010	0.0115	0.0097	0.0200	0.0241	0.2450	0.1285	0.5271	0.0318
1	21	0.0000	0.0003	0.0010	0.0000	0.0000	0.0008	0.0103	0.0086	0.0181	0.0206	0.2464	0.1321	0.5271	0.0347
1	22	0.0000	0.0013	0.0000	0.0000	0.0000	0.0008	0.0107	0.0081	0.0170	0.0199	0.2451	0.1341	0.5271	0.0359
1	23	0.0021	0.0003	0.0000	0.0010	0.0000	0.0010	0.0118	0.0100	0.0205	0.0224	0.2452	0.1274	0.5271	0.0312
1	24	0.0031	0.0003	0.0000	0.0010	0.0001	0.0011	0.0134	0.0124	0.0240	0.0267	0.2404	0.1226	0.5271	0.0278

SVMT.DEF

2	1	0.0004	0.0052	0.0061	0.0053	0.0158	0.0854	0.3210	0.1382	0.2804	0.0595	0.0628	0.0103	0.0095	0.0001
2	2	0.0036	0.0029	0.0059	0.0234	0.0735	0.1114	0.2842	0.0950	0.2633	0.0396	0.0698	0.0107	0.0169	0.0000
2	3	0.0033	0.0021	0.0032	0.0085	0.0436	0.1130	0.2914	0.1076	0.2835	0.0424	0.0719	0.0091	0.0204	0.0000
2	4	0.0030	0.0015	0.0011	0.0015	0.0183	0.1001	0.2910	0.1246	0.3013	0.0535	0.0743	0.0094	0.0204	0.0000
2	5	0.0030	0.0014	0.0005	0.0017	0.0181	0.1008	0.2898	0.1246	0.3015	0.0537	0.0751	0.0094	0.0204	0.0000
2	6	0.0034	0.0017	0.0021	0.0049	0.0344	0.1091	0.2894	0.1125	0.2932	0.0460	0.0735	0.0093	0.0205	0.0000
2	7	0.0040	0.0021	0.0027	0.0078	0.0427	0.1134	0.2857	0.1083	0.2886	0.0427	0.0724	0.0091	0.0205	0.0000
2	8	0.0038	0.0025	0.0020	0.0022	0.0216	0.1034	0.2834	0.1243	0.3020	0.0515	0.0736	0.0094	0.0203	0.0000
2	9	0.0041	0.0024	0.0020	0.0034	0.0249	0.1049	0.2844	0.1215	0.2986	0.0489	0.0751	0.0093	0.0205	0.0000
2	10	0.0052	0.0027	0.0032	0.0085	0.0450	0.1151	0.2822	0.1024	0.2835	0.0419	0.0777	0.0096	0.0230	0.0000
2	11	0.0049	0.0165	0.0087	0.0224	0.0652	0.1222	0.2809	0.0959	0.2557	0.0405	0.0651	0.0095	0.0125	0.0000
2	12	0.0055	0.0071	0.0082	0.0219	0.0675	0.1169	0.2771	0.0915	0.2637	0.0394	0.0712	0.0106	0.0194	0.0000
2	13	0.0043	0.0024	0.0016	0.0038	0.0255	0.1005	0.2849	0.1205	0.2996	0.0497	0.0761	0.0100	0.0211	0.0000
2	14	0.0038	0.0021	0.0018	0.0015	0.0115	0.0734	0.2923	0.1219	0.3170	0.0641	0.0794	0.0100	0.0211	0.0001
2	15	0.0037	0.0017	0.0012	0.0019	0.0103	0.0558	0.3040	0.1067	0.3309	0.0702	0.0824	0.0100	0.0211	0.0001
2	16	0.0036	0.0018	0.0009	0.0012	0.0109	0.0530	0.3056	0.1064	0.3320	0.0707	0.0827	0.0100	0.0211	0.0001
2	17	0.0034	0.0009	0.0007	0.0015	0.0104	0.0531	0.3065	0.1064	0.3325	0.0706	0.0829	0.0100	0.0211	0.0000
2	18	0.0030	0.0013	0.0016	0.0018	0.0103	0.0528	0.3057	0.1061	0.3327	0.0704	0.0831	0.0100	0.0211	0.0001
2	19	0.0000	0.0000	0.0000	0.0003	0.0087	0.0502	0.3303	0.1054	0.3306	0.0699	0.0733	0.0100	0.0211	0.0002
2	20	0.0001	0.0000	0.0000	0.0000	0.0082	0.0496	0.3302	0.1057	0.3293	0.0696	0.0757	0.0101	0.0211	0.0004
2	21	0.0000	0.0000	0.0000	0.0000	0.0081	0.0491	0.3306	0.1060	0.3298	0.0693	0.0755	0.0101	0.0211	0.0004
2	22	0.0000	0.0000	0.0000	0.0000	0.0077	0.0489	0.3291	0.1060	0.3316	0.0692	0.0758	0.0101	0.0211	0.0005
2	23	0.0000	0.0000	0.0000	0.0000	0.0082	0.0497	0.3286	0.1056	0.3311	0.0697	0.0756	0.0101	0.0211	0.0003
2	24	0.0000	0.0000	0.0000	0.0000	0.0085	0.0502	0.3271	0.1054	0.3324	0.0699	0.0752	0.0100	0.0211	0.0002



Average Speed

AVERAGE SPEED : 36.5 FREEWAY 92.0 0.0 0.0 8.0

Optional Command	No Default Values	Scenario Section
------------------	-------------------	------------------

Single average speed for a specified roadway scenario in mph

- 2.5 mph to 65 mph, inclusive
- Replaces the VMT BY FACILITY and SPEED VMT commands
- Distribution by 4 facility types may be specified for the FREEWAY and AREAWIDE roadway scenarios in % or fractions. Sum of the 4 facility type values must equal 1.0.

Use when modeling individual roadway links, preferably for time periods of less than a day

The AVERAGE SPEED Command

AVERAGE SPEED : 27.6 AREAWIDE 34.2 49.8 13.0 3.0

↓ Ramp VMT Fraction

↓ Local VMT Fraction

↓ Arterial VMT Fraction

↓ Freeway VMT Fraction

Roadway Scenario:

Non-Ramp – No VMT Fractions Apply (Assigns 100% Freeway)

Freeway – Only Freeway and Ramp VMT Apply

Arterial – No VMT Fractions Apply (Assigns 100% Arterial)

Areawide – Freeway, Arterial, Local, and Ramp VMT Apply

↓ Average Speed Value (2.5 to 65 mph)

Average Speed Options

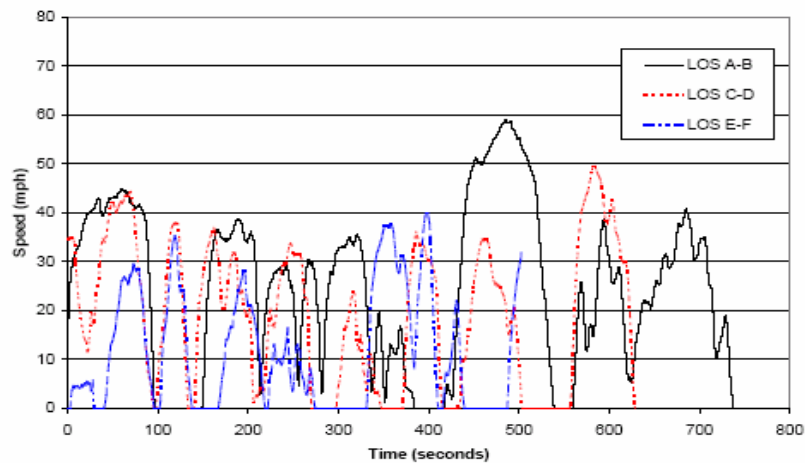
AVERAGE SPEED : 36.5 FREEWAY 92.0 0.0 0.0 8.0
(includes ramps as 8% of freeway travel; average speed includes freeway mainline plus ramps at 34.6 mph)

AVERAGE SPEED : 36.5 NON-RAMP
(freeway mainline only, at 36.5 mph)

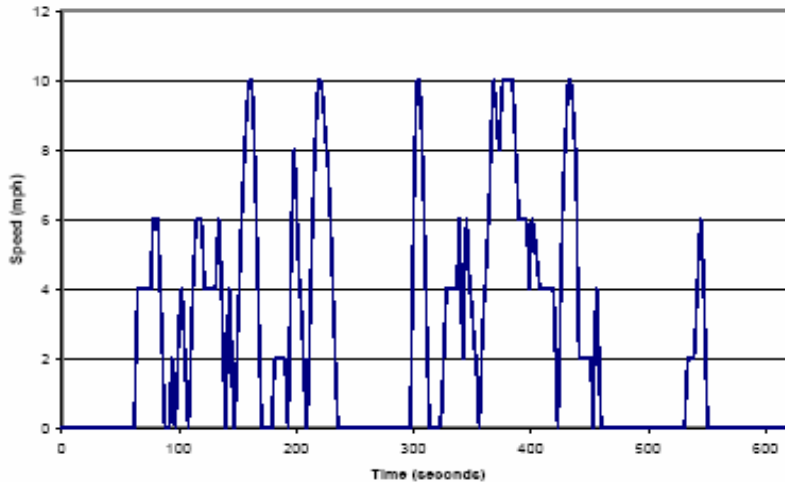
AVERAGE SPEED : 36.5 ARTERIAL
(arterial street at 36.5 mph)

AVERAGE SPEED : 2.5 ARTERIAL
(used to calculate idle emissions for hotspot modeling)

Arterial/Collector Speed Cycles



Speed-Time Profile for EPA Low-Speed Cycle
(Average Cycle Speed = 2.5 mph)



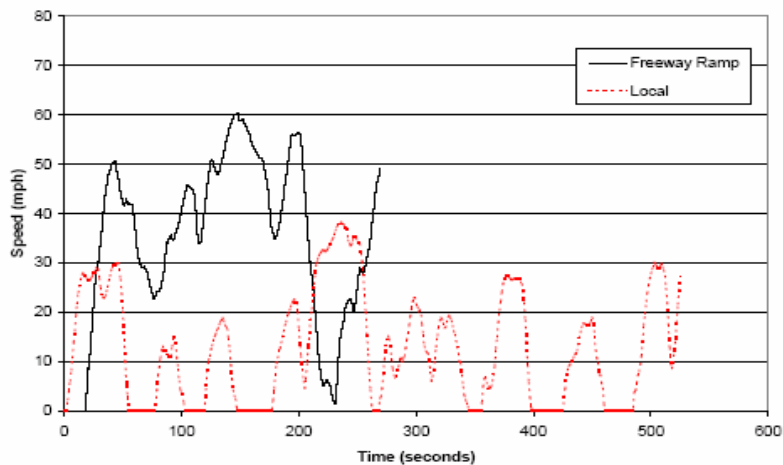
Speeds for Ramps and Locals

There are no official AVERAGE SPEED options for ramps and local streets

These streets are modeled in MOBILE6 at 34.6 mph and 12.9 mph, respectively

Can model with VMT BY FACILITY command, with external data file VMT set to 1.0 (100%) for ramp or local

Local Road and Freeway Ramp Speed Cycles



Vehicle Engine Starts per Day

In general, emissions associated with vehicle engine starts do not occur on arterial or freeway facilities. The emissions component due to vehicle engine starts can be excluded by specifying zero engine starts per day.

STARTS PER DAY : NOSTARTS.D

Optional Command

Default File =
STPERDAY.D

Run Section

Average number of vehicle starts per day for one or more of the 18 affected classes for 25 model years by weekday and weekend

- 0 – 100, inclusive

Vehicle Engine Starts per Day (continued)

An external file of zero engine starts has been prepared:
NOSTARTS.D



NOSTARTS.D

STARTS PER DAY

*
* Engine starts per day by vehicle class. The lines which start with the number 1 have values
* for weekdays and the lines which start with the number 2 have values for weekends. The second
* number in each line is the vehicle type category (see the list below). And the third entry is
* the value of the starts per day for each of the 25 vehicle ages in a given calendar year.
*

* Number	Abbreviation	Description
* 1	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
* 2	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
* 3	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
* 4	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
* 5	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
* 6	HDGV2B	Class 2b Heavy-Duty Gasoline Vehicles (8501-10,000 lbs. GVWR)
* 7	HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
* 8	HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
* 9	HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
* 10	HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
* 11	HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
* 12	HDGV8A	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
* 13	HDGV8B	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
* 14	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
* 15	LDDT12	Light-Duty Diesel Trucks 1 (0-6,000 lbs. GVWR)
* 16	HDDV2B	Class 2b Heavy-Duty Diesel Vehicles (8501-10,000 lbs. GVWR)

NOSTARTS.D

* 17	HDDV3	Class 3 Heavy Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
* 18	HDDV4	Class 4 Heavy Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
* 19	HDDV5	Class 5 Heavy Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
* 20	HDDV6	Class 6 Heavy Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
* 21	HDDV7	Class 7 Heavy Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
* 22	HDDV8A	Class 8a Heavy Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
* 23	HDDV8B	Class 8b Heavy Duty Diesel Vehicles (>60,000 lbs. GVWR)
* 24	MC	Motorcycles (Gasoline)
* 25	HDGB	Gasoline Busses (School, Transit and Urban)
* 26	HDDBT	Diesel Transit and Urban Busses
* 27	HDDBS	Diesel School Busses
* 28	LDDT34	Light Duty Diesel Trucks 1 (6,001-8500 lbs. GVWR)
* 1	1	25*0.0
1	2	25*0.0
1	3	25*0.0
1	4	25*0.0
1	5	25*0.0
1	6	25*0.0
1	14	25*0.0
1	15	25*0.0
1	24	25*0.0
1	28	25*0.0

NOSTARTS.D

2	1	25*0.0
2	2	25*0.0
2	3	25*0.0
2	4	25*0.0
2	5	25*0.0
2	6	25*0.0
2	14	25*0.0
2	15	25*0.0
2	24	25*0.0
2	28	25*0.0

Vehicle Fuel Specifications

Gasoline Volatility

Oxygenated Fuels

Gasoline Sulfur Content

Diesel Sulfur Content

Vehicle Fuel Specifications (continued)

Gasoline Aromatic Content

Gasoline Olefin Content

Gasoline Benzene Content

Gasoline Evaporated at 200 °F

Gasoline Evaporated at 300 °F

Gasoline Oxygen Content

Gasoline Volatility

Use locally-determined gasoline RVP for on-road mobile sources following procedures in EPA 450-4-81-026d (revised), 1992 and 40 CFR 80.27 (a) and (b)

One average RVP is used for all gasoline fueled vehicles for all hours of the day

The nominal RVP value chosen should not include the effects of added oxygenates as such effects are accounted for in MOBILE6.2

Gasoline Volatility (continued)

Automotive gasoline is adjusted seasonally by manufacturers to meet EPA's volatility regulation and ASTM fuel volatility specification D-4814

High volatility gasoline is supplied during winter months when high temperatures are unlikely to occur

Low volatility gasoline is supplied during the summer months when low temperatures are unlikely to occur

Suppliers generally publish specification schedules

Gasoline Volatility (continued)

Example Monthly Fuel Specifications

Month	Maximum Fuel RVP (psi)	ASTM Classification
January	15.0	E
February	15.0	E
March	13.5	D
April	11.5	C
May	9.0	A
June	9.0	A
July	9.0	A
August	9.0	A
September	10.0	B
October	11.5	C
November	13.5	D
December	15.0	E

Gasoline Volatility (continued)

FUEL RVP : 7.8

Required Command

No Default Value

Run or Scenario
Section

Average in-use Reid Vapor Pressure (RVP) of gasoline in pounds per square inch (psi)

- 6.5 psi – 15.2 psi, inclusive

Oxygenated Fuels

Areas with significant market penetration ($\geq 2\%$) of ether and/or alcohol gasoline blends should characterize the oxygen content of the fuels

All areas which have opted into or are part of the federal Reformulated Gasoline (RFG) program should explicitly account for oxygenated fuels

MOBILE6.2 has a built-in RFG option that may be applied to northern or southern region RFG programs, but it doesn't function properly for wintertime gasoline

Gasoline Oxygen Content (continued)

OXYGENATED FUELS : 0.035 0.129 0.027 0.031 2

Optional Command

No Default Value

Run or Scenario
Section

5 required data fields:

- Ether blend market share (decimal fraction, 0.000 to 1.000)
- Alcohol blend market share (decimal fraction, 0.000 to 1.000)
- Average oxygen content of ether blend fuels (decimal weight fraction, 0.000 to 0.027, inclusive)
- Average oxygen content of alcohol blend fuels (decimal weight fraction, 0.000 to 0.035, inclusive)
- RVP waiver for alcohol blends to exceed the RVP requirements by up to 1 psi (1 = no; 2 = yes)

Gasoline Sulfur Content

Beginning with the 2000 calendar year, local gasoline sulfur content will be affected by federal controls promulgated in the Tier 2 rule

MOBILE6.2 contains default values for gasoline sulfur content for each calendar year, beginning with 2000 and for the period prior to calendar year 2000

For calendar year 2000 or later, use the appropriate phase-in schedule prescribed by the Tier 2 rule

- EPA should be consulted before non-default values for gasoline sulfur content are used for calendar year 2000 or later

Gasoline Sulfur Content (continued)

FUEL PROGRAM : 1

Optional Command	Default Value = 1	Run or Scenario Section
------------------	-------------------	-------------------------

Applicable to Calendar Years 2000 and Beyond. Choices:

- 1 – Conventional Gasoline East (applicable to most of the nation)
- 3 – Conventional Gasoline West
- 4 – User-supplied gasoline sulfur levels

Gasoline Sulfur Content (continued)

Notes:

- When FUEL PROGRAM, option 4 is used, 32 values indicating the average and maximum gasoline sulfur content (in parts per million) must be provided in the lines following the command
 - The first 16 values are averages for calendar years 2000 through 2015
 - The next 16 values are maximums for calendar years 2000 through 2015
- In general, do not use Option 2 to specify an adopted reformulated gasoline (RFG) program representative of northern (= 2 N) or southern (= 2 S) regions. It doesn't function properly for the winter season and is incompatible with the OXYGENATE command required for AIR TOXICS emission factors.

Diesel Sulfur Content

Federal controls on highway diesel sulfur content will be phased in between June 2006 through May 2010

- Use 43 ppm for the phase-in period and 11 ppm thereafter
- EPA provides past data in "Diesel Sulfur Levels by County"

DI ESEL SULFUR : 15. 0

Required Command*	No Default Value	Scenario Section
-------------------	------------------	------------------

*For PM emission factors

Average diesel fuel sulfur level in parts per million (ppm)

- 0.01 ppm – 5000 ppm, inclusive

Gasoline Aromatic Content

GAS AROMATIC% : 20.0

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Gasoline aromatic content in % by volume

- 10% – 55%, inclusive

Gasoline Olefin Content

GAS OLEFIN% : 10.0

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Gasoline olefin content in % by volume

- 0% – 30%, inclusive

Gasoline Benzene Content

GAS BENZENE% : 1.0

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Gasoline benzene content in % by volume

- 0% – 5%, inclusive

Gasoline Evaporated at 200 °F

E200 : 50.0

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Percentage of vapor a gasoline fuel produces at 200 °F

- 30% – 70%, inclusive

Gasoline Evaporated at 300 °F

E300 : 90.0

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Percentage of vapor a gasoline fuel produces at 300 °F

- 30% – 100%, inclusive

Gasoline Oxygen Content

OXYGENATE : MTBE 15.1 0.50
ETBE 0.0 0.00
ETOH 10.0 0.50
TAME 0.0 0.00

Required Command	No Default Value	Scenario Section
------------------	------------------	------------------

Oxygenate type –

- MTBE is methyl tertiary butyl ether; ETBE is ethyl tertiary butyl ether; ETOH is ethanol; and TAME is tertiary amyl methyl ether

Oxygenate content in the fuel (volume %) –

- Max: MTBE=15.1%, ETBE=17.6%, ETOH=10.6%, TAME=16.5%

Market share fraction –

- 0 – 1, inclusive

Appendix -- 1990 Baseline Fuel Specifications

Area	Abbrev.	Year	Season	RVP, psi	Aromatics	Olefins Benzene %	Sulfur	E200 %	E300 %	MTBE %	ETBE %	EIOH %	TAME %	Oxygen wt %
Atlanta	AT	1990	Summer	8.5	27.9	10.5	1.16	344	40.7	79.0	0.0	0.0	0.0	0.00
Atlanta	AT	1990	Winter	12.5	26.2	14.4	1.49	267	49.1	82.4	0.0	0.0	0.0	0.00
Chicago	CH	1990	Summer	8.7	28.8	8.6	1.35	512	47.2	78.6	0.0	0.0	0.0	0.00
Chicago	CH	1990	Winter	13.7	23.0	9.1	1.99	400	54.4	82.6	0.0	0.0	0.0	0.00
Denver	DN	1990	Summer	8.3	24.8	12.2	1.41	375	45.1	79.4	0.0	0.0	0.0	0.00
Denver	DN	1990	Winter	12.1	19.3	12.8	1.23	272	62.0	85.5	11.6	0.0	0.0	2.06
Houston	HS	1990	Summer	8.3	30.2	10.9	1.36	375	46.7	79.4	0.5	0.0	0.0	0.10
Houston	HS	1990	Winter	12.8	33.0	14.4	1.22	464	52.4	80.2	0.0	0.0	0.0	0.00
Minneapolis	MN	1990	Summer	9.5	29.8	8.3	1.69	422	45.9	78.9	0.0	0.0	0.0	0.00
Minneapolis	MN	1990	Winter	13.2	24.9	9.3	1.86	701	56.0	81.8	0.0	0.0	0.0	0.00
New York	NY	1990	Summer	8.3	31.9	13.9	1.06	367	43.1	78.8	2.4	0.0	0.0	0.42
New York	NY	1990	Winter	13.3	26.4	16.7	1.55	274	49.5	81.8	0.0	0.0	0.0	0.00
Philadelphia	PA	1990	Summer	8.4	29.2	13.7	0.86	371	43.6	79.0	0.0	0.0	0.0	0.00
Philadelphia	PA	1990	Winter	13.9	23.5	13.2	1.63	206	50.5	82.9	0.0	0.0	0.0	0.00
Phoenix	PX	1990	Summer	8.1	33.0	5.9	2.15	123	41.1	75.5	0.0	0.0	0.0	0.00
Phoenix	PX	1990	Winter	10.9	26.4	5.6	1.88	157	56.5	82.9	11.4	0.0	0.0	2.04
Spokane	SP	1990	Summer	8.6	21.0	8.0	1.36	739	46.6	82.6	0.0	0.0	0.0	0.00
Spokane	SP	1990	Winter	13.1	19.2	10.3	1.58	698	51.1	84.9	0.0	0.0	0.0	0.00
St. Louis	SL	1990	Summer	8.8	28.9	8.9	1.11	372	45.2	78.9	0.0	0.0	0.0	0.00
St. Louis	SL	1990	Winter	13.2	22.0	11.4	1.71	319	54.0	82.7	0.0	0.0	0.0	0.00
Western WA/OR - Win 95/96	WA	1990	Summer	9.4	29.0	10.0	2.34	449	43.5	81.0	1.8	0.0	0.0	0.32
Western WA/OR - Win 95/96	WA	1990	Winter	12.9	30.9	8.2	2.47	314	49.7	83.7	0.5	0.0	0.0	0.08
Western WA/OR - Win 96/97	WB	1990	Summer	9.4	29.0	10.0	2.34	449	43.5	81.0	1.8	0.0	0.0	0.32
Western WA/OR - Win 96/97	WB	1990	Winter	12.9	30.9	8.2	2.47	314	49.7	83.7	0.5	0.0	0.0	0.08
Northern California	CN	1990	Summer	8.3	29.9	11.5	2.17	104	41.8	82.2	0.0	0.0	0.0	0.00
Northern California	CN	1990	Winter	12.4	29.9	9.6	2.14	135	49.3	84.3	0.5	0.0	0.0	0.08
Southern California	CS	1990	Summer	8.2	29.1	7.6	2.12	172	40.8	80.8	2.8	0.0	0.0	0.50
Southern California	CS	1990	Winter	11.3	29.8	8.6	1.81	205	45.9	82.6	0.5	0.0	0.0	0.08
IDMTWY	ID	1990	Summer	8.3	24.6	9.9	1.98	565	47.5	84.1	0.2	0.0	0.0	0.04
IDMTWY	ID	1990	Winter	13.0	22.5	13.7	1.71	681	53.8	86.5	0.5	0.0	0.0	0.08
UT/NM/NV	UT	1990	Summer	8.7	23.7	11.0	1.97	235	44.6	82.8	1.3	0.0	0.0	0.22
UT/NM/NV	UT	1990	Winter	13.0	23.5	13.5	2.13	159	56.3	87.4	0.0	0.0	0.0	16.5
ND/SO/NE/IA/KS/Western MO	ND	1990	Summer	8.8	26.8	9.6	1.50	328	47.4	81.3	0.7	0.0	1.5	0.84
ND/SO/NE/IA/KS/Western MO	ND	1990	Winter	13.3	21.0	10.8	1.29	307	55.3	84.6	0.8	0.0	1.6	0.70
AR/MS/AL/SC/Northern LA	SE	1990	Summer	8.6	28.8	12.8	1.62	363	43.0	79.5	1.5	0.0	0.0	0.27
AR/MS/AL/SC/Northern LA	SE	1990	Winter	12.3	25.6	16.9	1.47	328	50.0	81.6	1.2	0.0	0.0	0.22
Florida	FL	1990	Summer	9.2	31.8	9.0	1.40	363	44.1	79.2	1.5	0.0	0.0	0.27
Florida	FL	1990	Winter	12.2	28.0	17.7	1.25	372	48.9	80.3	1.2	0.0	0.0	0.21
Northeast-NoRFG	NN	1990	Summer	8.8	29.7	13.7	1.77	332	42.5	80.4	1.1	0.0	0.0	0.19
Northeast-NoRFG	NN	1990	Winter	13.5	26.5	17.3	1.42	343	51.6	82.9	1.2	0.0	0.0	0.22
Northeast-RFG	NR	1990	Summer	8.5	29.7	13.7	1.77	332	42.5	80.4	1.1	0.0	0.0	0.19
Northeast-RFG	NR	1990	Winter	13.5	26.5	17.3	1.42	343	51.6	82.9	1.2	0.0	0.0	0.22
Ohio Valley-NoRFG	ON	1990	Summer	9.7	26.8	10.5	1.59	383	46.8	80.3	1.3	0.0	2.0	0.93
Ohio Valley-NoRFG	ON	1990	Winter	14.1	24.9	11.1	1.56	333	55.6	82.6	0.9	0.0	2.0	0.84
Ohio Valley-RFG	OR	1990	Summer	9.7	26.8	10.5	1.59	383	46.8	80.3	1.3	0.0	2.0	0.93
Ohio Valley-RFG	OR	1990	Winter	14.1	24.9	11.1	1.56	333	55.6	82.6	0.9	0.0	2.0	0.84
Northern MI/WI	MI	1990	Summer	9.4	27.1	8.5	1.57	363	49.2	80.8	2.5	0.0	1.8	1.06
Northern MI/WI	MI	1990	Winter	14.0	24.5	9.6	1.36	352	55.8	83.4	5.4	0.0	1.9	1.62
West Texas	WT	1990	Summer	8.0	26.6	9.6	1.83	289	45.3	81.4	1.4	0.0	0.0	0.43
West Texas	WT	1990	Winter	11.7	27.2	14.6	1.75	362	49.2	82.8	5.2	0.0	0.0	0.93

Appendix -- 1996 Baseline Fuel Specifications

Area	Abbrev	Year	Season	RVP, psi	Aromatics	Olefins Benzene %	Sulfur	E200 %	E300 %	MTBE %	ETBE %	EIOH %	TAME %	Oxygen wt %
Atlanta	AT	1996	Summer	7.2	32.1	11.2	0.87	343	36.9	79.8	0.7	0.0	0.0	0.13
Atlanta	AT	1996	Winter	12.4	24.8	13.0	0.77	447	51.2	82.7	0.3	0.0	0.0	0.06
Chicago	CH	1996	Summer	7.9	28.0	9.7	0.96	462	50.2	80.8	0.0	0.0	0.0	3.12
Chicago	CH	1996	Winter	14.0	22.4	7.8	0.80	523	55.0	83.9	0.0	0.0	0.0	3.11
Denver	DN	1996	Summer	8.8	27.1	8.8	1.33	298	50.1	83.1	0.0	0.0	0.0	0.00
Denver	DN	1996	Winter	13.6	21.9	9.2	0.94	350	62.1	86.1	0.0	0.0	8.4	0.291
Houston	HS	1996	Summer	7.1	27.4	13.0	0.71	261	47.8	79.8	9.8	0.0	0.0	1.74
Houston	HS	1996	Winter	12.8	21.1	12.8	0.70	224	59.9	83.8	7.9	0.0	0.0	1.41
Minneapolis	MN	1996	Summer	9.6	28.2	7.3	1.81	121	59.4	84.6	0.0	0.0	9.4	0.324
Minneapolis	MN	1996	Winter	14.9	23.4	5.3	1.85	70	62.3	89.1	0.0	0.0	8.0	0.277
New York	NY	1996	Summer	9.0	28.8	17.1	0.51	231	49.8	81.5	0.5	0.0	0.0	1.59
New York	NY	1996	Winter	13.2	23.3	16.6	0.47	267	57.5	85.7	14.5	0.0	0.0	2.58
Philadelphia	PA	1996	Summer	7.9	29.0	12.3	0.80	367	51.2	81.8	11.3	0.0	0.0	2.01
Philadelphia	PA	1996	Winter	13.5	25.4	10.2	0.83	337	59.3	85.9	8.8	0.0	0.0	1.58
Phoenix	PX	1996	Summer	8.6	39.1	6.8	1.07	118	45.7	75.2	0.8	0.0	0.0	0.14
Phoenix	PX	1996	Winter	8.7	34.3	7.1	1.40	218	50.2	82.6	0.0	0.0	10.2	3.53
Spokane	SP	1996	Summer	8.7	28.5	8.3	1.32	412	45.0	81.4	0.0	0.0	0.0	0.00
Spokane	SP	1996	Winter	14.8	18.8	5.9	0.97	350	59.8	87.1	0.0	0.0	9.3	0.321
St. Louis	SL	1996	Summer	8.8	29.9	12.0	0.70	462	39.0	78.6	0.0	0.0	0.0	0.00
St. Louis	SL	1996	Winter	13.6	23.8	11.4	0.99	535	62.7	82.6	0.0	0.0	0.0	0.00
Western WA/OR - Win 95/96	WA	1996	Summer	8.0	35.7	6.7	2.17	258	44.0	82.4	0.1	0.0	0.0	0.02
Western WA/OR - Win 95/96	WA	1996	Winter	13.6	27.5	6.3	1.81	342	55.8	84.5	0.0	0.0	4.3	1.49
Western WA/OR - Win 96/97	WB	1996	Summer	8.0	35.7	6.7	2.17	258	44.0	82.4	0.1	0.0	0.0	0.02
Western WA/OR - Win 96/97	WB	1996	Winter	13.4	29.4	5.8	1.81	345	62.7	84.0	0.0	0.0	1.3	0.44
Northern California	CN	1996	Summer	6.9	24.4	3.5	0.96	26	49.3	86.9	9.1	0.0	0.0	1.83
Northern California	CN	1996	Winter	10.5	20.1	2.1	0.52	30	54.4	90.5	10.5	0.0	0.0	1.97
Southern California	CS	1996	Summer	7.0	20.7	4.3	0.52	10	51.0	86.8	11.0	0.0	0.0	1.86
Southern California	CS	1996	Winter	10.6	17.7	3.5	0.57	31	56.3	88.6	11.6	0.0	0.0	2.08
IDMTWY	ID	1996	Summer	8.5	28.3	8.1	1.94	318	46.8	84.6	0.5	0.0	0.0	0.09
IDMTWY	ID	1996	Winter	13.5	22.8	6.4	1.40	352	53.7	84.6	0.5	0.0	0.0	0.09
UTNMNV	UT	1996	Summer	8.0	30.7	10.6	1.75	207	45.2	83.6	1.1	0.0	0.0	0.20
UTNMNV	UT	1996	Winter	14.4	20.4	8.3	1.14	108	72.2	85.2	0.0	0.0	10.3	0.354
ND/SD/NE/IA/KS/Western MO	ND	1996	Summer	8.3	29.0	8.0	1.33	229	45.4	79.8	0.1	0.0	1.7	0.59
ND/SD/NE/IA/KS/Western MO	ND	1996	Winter	13.4	22.4	6.8	1.12	204	55.0	85.0	0.4	0.0	1.8	0.24
AR/MS/AL/SC/Northern LA	SE	1996	Summer	7.7	30.7	13.2	0.94	349	38.8	78.1	0.5	0.0	0.0	0.08
AR/MS/AL/SC/Northern LA	SE	1996	Winter	12.2	24.5	13.0	0.81	271	50.5	82.3	0.4	0.0	0.0	0.08
Florida	FL	1996	Summer	7.6	33.9	10.1	0.79	280	45.3	79.4	0.5	0.0	0.0	0.39
Florida	FL	1996	Winter	12.1	24.8	12.8	0.82	289	50.5	82.7	0.4	0.0	0.0	0.07
Northeast-NoRFG	NN	1996	Summer	8.6	28.1	12.4	1.03	308	43.2	80.7	1.5	0.0	0.0	0.27
Northeast-NoRFG	NN	1996	Winter	13.2	23.8	10.2	0.73	222	62.2	83.3	0.8	0.0	0.0	0.14
Northeast-RFG	NR	1996	Summer	7.9	24.6	11.7	0.85	234	50.5	82.4	10.9	0.0	0.0	1.94
Northeast-RFG	NR	1996	Winter	12.5	19.7	9.6	0.86	265	59.1	87.0	10.5	0.0	0.0	1.87
Ohio Valley-NoRFG	ON	1996	Summer	9.2	32.3	8.7	1.63	138	34.5	79.0	0.9	0.0	0.0	0.67
Ohio Valley-NoRFG	ON	1996	Winter	14.1	25.5	8.8	1.04	110	54.0	82.6	0.4	0.0	1.2	0.48
Ohio Valley-RFG	OR	1996	Summer	7.8	27.3	8.1	0.99	300	45.5	81.1	9.5	0.0	0.0	1.56
Ohio Valley-RFG	OR	1996	Winter	13.9	24.5	8.2	0.86	255	54.4	84.0	10.0	0.0	0.0	1.76
Northern M/WI	MI	1996	Summer	8.5	28.4	9.1	1.32	277	49.0	80.9	0.5	0.0	2.8	0.04
Northern M/WI	MI	1996	Winter	14.0	25.3	8.4	1.46	208	57.9	83.1	0.2	0.0	2.4	0.08
West Texas	TX	1996	Summer	9.3	30.1	9.7	1.48	268	41.6	81.2	0.2	0.0	0.0	0.09
West Texas	TX	1996	Winter	11.8	26.3	8.1	1.21	361	47.3	83.7	0.0	0.0	0.0	0.00

Appendix -- 2007/2020 30 ppm Sulfur Fuel Specifications

Area	Abbrev.	Year	Season	Scenario	RVP, psi	Aromatic	Olefins	Benzene	Sulfur	E200 %	E300 %	MTBE %	ETBE %	EOH %	TAME %	Oxygen
Atlanta	AT	2007	Summer	30 ppm	7.0	20.9	8.6	0.87	30	38.1	80.2	1.7	0.0	0.0	0.0	0.30
Atlanta	AT	2007	Winter	30 ppm	12.4	24.0	11.4	0.77	30	50.8	82.7	0.6	0.0	0.0	0.0	0.10
Chicago	CH	2007	Summer	30 ppm	8.6	24.1	6.2	0.93	30	51.2	82.7	0.0	13.7	0.0	0.0	2.10
Chicago	CH	2007	Winter	30 ppm	14.0	17.8	2.9	0.90	30	60.1	87.3	0.0	0.0	10.7	0.0	3.70
Denver	DN	2007	Summer	30 ppm	8.8	25.1	7.0	1.33	30	51.3	83.5	0.0	0.0	0.0	0.0	0.00
Denver	DN	2007	Winter	30 ppm	13.6	21.2	8.0	0.94	30	61.7	88.1	0.0	0.0	8.4	0.0	2.90
Houston	HS	2007	Summer	30 ppm	6.7	26.8	9.7	0.78	30	48.5	82.5	11.2	0.0	0.0	0.0	2.00
Houston	HS	2007	Winter	30 ppm	12.8	19.7	5.0	0.97	30	56.5	89.4	10.9	0.0	0.0	0.0	1.90
Minneapolis	MN	2007	Summer	30 ppm	9.6	27.2	5.8	1.81	30	60.6	85.1	0.0	0.0	9.8	0.0	3.30
Minneapolis	MN	2007	Winter	30 ppm	14.9	22.7	4.7	1.66	30	61.9	89.1	0.0	0.0	8.1	0.0	2.80
New York	NY	2007	Summer	30 ppm	6.8	25.8	11.9	0.59	30	49.9	83.8	11.2	0.0	0.0	0.0	2.00
New York	NY	2007	Winter	30 ppm	13.2	19.3	5.6	0.53	30	55.1	89.0	14.9	0.0	0.3	0.0	2.70
Philadelphia	PA	2007	Summer	30 ppm	6.7	25.0	10.3	0.66	30	51.1	84.1	11.8	0.0	0.0	0.0	2.10
Philadelphia	PA	2007	Winter	30 ppm	13.5	21.0	5.2	0.62	30	56.5	87.6	11.2	0.0	0.0	0.0	2.00
Phoenix	PX	2007	Summer	30 ppm	7.0	22.0	4.0	0.80	30	50.0	92.0	0.0	0.0	5.1	0.0	2.10
Phoenix	PX	2007	Winter	30 ppm	10.6	17.7	3.5	0.57	30	56.3	88.8	0.0	0.0	10.2	0.0	3.50
Spokane	SP	2007	Summer	30 ppm	8.7	27.5	6.6	1.32	30	46.2	81.8	0.0	0.0	0.0	0.0	0.00
Spokane	SP	2007	Winter	30 ppm	14.8	17.9	6.0	0.98	30	59.8	87.2	0.0	0.0	10.2	0.0	3.60
St. Louis	SL	2007	Summer	30 ppm	6.4	28.8	11.3	0.72	30	45.0	79.8	0.0	13.7	0.0	0.0	2.10
St. Louis	SL	2007	Winter	30 ppm	13.6	20.7	4.9	0.89	30	52.5	84.7	0.0	0.0	6.1	0.0	2.10
Western Washington/Oregon	WA	2007	Summer	30 ppm	8.0	34.5	5.3	2.17	30	45.2	82.8	0.0	0.0	0.0	0.0	0.00
Western Washington/Oregon	WA	2007	Winter	30 ppm	13.5	27.6	5.3	1.81	30	55.4	84.2	0.0	0.0	2.9	0.0	1.00
Western Washington/Oregon	WB	2007	Summer	30 ppm	9.0	34.5	5.3	2.17	30	45.2	82.8	0.0	0.0	0.0	0.0	0.00
Western Washington/Oregon	WB	2007	Winter	30 ppm	13.5	27.6	5.3	1.81	30	55.4	84.2	0.0	0.0	2.9	0.0	1.00
Northern California	CN	2007	Summer	30 ppm	7.0	22.0	4.0	0.80	30	50.0	92.0	0.0	0.0	6.1	0.0	2.10
Northern California	CN	2007	Winter	30 ppm	10.5	20.1	2.1	0.52	30	54.4	90.8	0.0	0.0	6.1	0.0	2.10
Southern California	CS	2007	Summer	30 ppm	7.0	22.0	4.0	0.80	30	50.0	92.0	0.0	0.0	6.1	0.0	2.10
Southern California	CS	2007	Winter	30 ppm	10.6	17.7	3.5	0.57	30	56.3	88.8	0.0	0.0	6.1	0.0	2.10
Idaho/Montana/Wyoming	ID	2007	Summer	30 ppm	8.5	27.3	6.6	1.54	30	48.0	86.0	1.1	0.0	0.0	0.0	0.20
Idaho/Montana/Wyoming	ID	2007	Winter	30 ppm	13.5	22.1	5.6	1.40	30	53.3	84.6	0.6	0.0	0.0	0.0	0.10
Utah/New Mexico/Nevada	UT	2007	Summer	30 ppm	8.0	20.6	8.5	1.75	30	49.4	84.0	2.2	0.0	0.0	0.0	0.40
Utah/New Mexico/Nevada	UT	2007	Winter	30 ppm	14.4	19.8	7.2	1.14	30	71.7	85.2	0.0	0.0	10.4	0.0	3.60
ND/SD/NE/IA/KS/Western MO	ND	2007	Summer	30 ppm	8.3	28.0	6.4	1.33	30	46.6	82.2	0.0	0.0	3.5	0.0	1.20
ND/SD/NE/IA/KS/Western MO	ND	2007	Winter	30 ppm	13.4	21.7	6.0	1.12	30	55.6	85.0	0.6	0.0	1.7	0.0	0.70
AR/MS/AL/SC/Northern LA	SE	2007	Summer	30 ppm	7.7	29.6	10.5	0.84	30	40.0	78.5	1.1	0.0	0.0	0.0	0.20
AR/MS/AL/SC/Northern LA	SE	2007	Winter	30 ppm	12.2	23.7	11.3	0.81	30	50.1	82.3	0.6	0.0	0.0	0.0	0.10
Florida	FL	2007	Summer	30 ppm	7.6	32.4	8.1	0.79	30	41.5	79.8	1.1	0.0	0.0	0.0	0.20
Florida	FL	2007	Winter	30 ppm	12.1	23.6	11.2	0.62	30	50.1	82.7	0.6	0.0	0.0	0.0	0.10
Northeastern states - non RFG	NN	2007	Summer	30 ppm	8.6	27.1	9.9	1.03	30	44.4	81.1	3.4	0.0	0.0	0.0	0.80
Northeastern states - non RFG	NN	2007	Winter	30 ppm	13.2	23.1	14.1	0.73	30	51.8	83.3	0.6	0.0	0.0	0.0	0.10
Northeastern states - with RFG	NR	2007	Summer	30 ppm	8.7	24.0	11.0	0.67	30	50.8	83.2	11.2	0.0	0.0	0.0	2.00
Northeastern states - with RFG	NR	2007	Winter	30 ppm	12.5	18.2	4.6	0.66	30	59.6	89.7	10.6	0.0	0.0	0.0	1.90
Ohio Valley - non-RFG	ON	2007	Summer	30 ppm	8.7	29.1	8.3	1.24	30	46.5	80.7	1.7	0.0	2.9	0.0	1.30
Ohio Valley - non-RFG	ON	2007	Winter	30 ppm	14.1	24.7	7.7	1.04	30	53.6	82.6	0.6	0.0	1.2	0.0	0.50
Ohio Valley - with RFG	OR	2007	Summer	30 ppm	8.5	27.1	7.6	1.02	30	45.6	81.9	9.5	0.0	0.0	0.0	1.70
Ohio Valley - with RFG	OR	2007	Winter	30 ppm	12.9	17.4	4.4	0.97	30	59.9	91.1	10.1	0.0	0.0	0.0	1.80
Northern MI/WI/MN	MI	2007	Summer	30 ppm	8.5	27.4	7.3	1.32	30	50.2	81.3	1.1	0.0	5.8	0.0	2.20
Northern MI/WI/MN	MI	2007	Winter	30 ppm	14.0	24.5	7.3	1.46	30	57.2	83.1	0.0	0.0	2.3	0.0	0.80
West Texas	WT	2007	Summer	30 ppm	8.0	26.1	7.8	1.48	30	42.7	82.0	0.6	0.0	0.0	0.0	0.10
West Texas	WT	2007	Winter	30 ppm	11.8	24.9	7.1	1.21	30	48.5	83.7	0.0	0.0	0.0	0.0	0.00

State Programs

Reformulated Gasoline (RFG) Programs

Inspection and Maintenance (I/M) Programs

Anti-Tampering Programs (ATP)

RFG Programs

Areas which have opted into or are part of the federal RFG program must account for the related requirements for SIP and conformity purposes

Appropriate data must be supplied defining the RFG Program, including:

- FUEL RVP;
- OXYGENATED FUELS; and
- FUEL PROGRAM

I/M Programs

Areas which have implemented I/M programs to reduce mobile source emissions must take them into account for SIP and conformity purposes

Up to seven exhaust and evaporative emissions I/M programs can be specified to reflect the requirements for different types and ages of vehicles and for different calendar years

I/M Programs (continued)

I/M DESC FILE : IMTEST.D

Optional Command	Default Value = No I/M	Run Section
------------------	---------------------------	-------------

Details on an area I/M program can be contained in an external file obtained from the state/local air agency and referenced

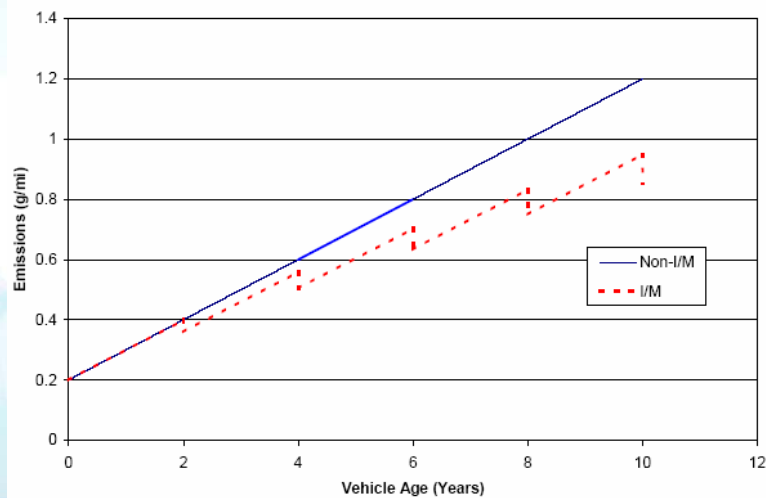
There is no default I/M program

I/M Programs (continued)

The state/local air agency maintains the appropriate inputs covering:

- Inspection type (11 exhaust, 4 evaporative)
- Test frequency (annual/biennial)
- Network type (computerized/manual test & repair; test only)
- Model years
- Vehicles
- Stringency
- Compliance rate
- Waiver rates
- Cutpoints
- Exemption age
- Grace period
- Technician training credits
- I/M effectiveness

Effect of an I/M Program on Fleet Emissions
as a Result of Identification and Repair of High Emitters



ATP

Some areas have implemented vehicle inspections to determine if emission controls have been removed or tampered with

The adopted ATP must be considered for SIP and conformity purposes

No tampering assumed for 1996+ model years – on-board diagnostic (OBD) system would detect it

ATP (continued)

ANTI -TAMP PROG :
83 75 50 22222 22222222 2 11 096. 22222222

Optional Command	Default Value = No ATP	Run Section
------------------	---------------------------	-------------

There is no default ATP

Check with state/local air agency for appropriate inputs covering:

- Start year
- Model years covered
- Vehicle types covered
- Inspection frequency
- Compliance rate
- Components tested

Special Considerations for Project-Level Analyses: Start and Evaporative Emissions

Refining the Analysis

MOBILE6.2 includes eight emissions types:

Running Exhaust	Start Exhaust
Hot Soak	Diurnal Soak
Running Losses	Resting Losses
Crankcase	Refueling

Standard MOBILE modeling practice is to use composite emission rates (all these emissions types averaged together)

TOXEXAMP.TXT - Notepad

File Edit Format Help

```

Altitude: LOW
Minimum Temperature: 68.0 (F)
Maximum Temperature: 84.0 (F)
Absolute Humidity: 75. grains/lb
Nominal fuel RVP: 7.0 psi
Weathered RVP: 7.0 psi
Fuel sulfur Content: 279. ppm

Exhaust I/M Program: NO
Evap I/M Program: NO
ATP Program: NO
Reformulated Gas: NA (See Air Toxics output)

Ether Blend Market Share: 0.550 Alcohol Blend Market Share: 0.450
Ether Blend Oxygen Content: 0.027 Alcohol Blend Oxygen Content: 0.035
Alcohol Blend RVP waiver: NO
  
```

Vehicle Type	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4638	0.3052	0.1042		0.0357	0.0008	0.0017	0.0827	0.0060	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	1.178	1.580	2.531	1.822	2.115	0.727	0.983	0.710	2.14	1.534
Composite CO :	14.10	17.32	25.48	19.39	19.82	1.713	1.704	3.687	11.77	15.568
Composite NOx :	1.172	1.352	1.745	1.452	5.137	1.650	1.699	16.061	1.23	2.661
Exhaust Emissions (g/mi):										
VOC Start:	0.313	0.418	0.744	0.501	0.301	0.414	0.301	0.414	0.400	
VOC Running:	0.397	0.527	0.850	0.609	0.426	0.569	0.426	0.569	1.244	
VOC Total Exhaust:	0.711	0.946	1.594	1.111	0.968	0.983	0.727	0.983	1.64	0.890
CO Start:	3.13	5.44	10.54	6.73	0.819	0.826	0.819	0.826	2.567	
CO Running:	10.98	11.88	14.94	12.66	0.894	0.879	0.894	0.879	9.200	
CO Total Exhaust:	14.10	17.32	25.48	19.39	19.82	1.713	1.704	3.687	11.77	15.568
NOx Start:	0.223	0.269	0.347	0.289	0.081	0.080	0.081	0.080	0.389	
NOx Running:	0.950	1.082	1.399	1.163	1.569	1.618	1.569	1.618	0.839	
NOx Total Exhaust:	1.172	1.352	1.745	1.452	5.137	1.650	1.699	16.061	1.23	2.661
Non-Exhaust Emissions (g/mi):										
Hot Soak Loss:	0.137	0.119	0.193	0.138	0.212	0.000	0.000	0.000	0.109	0.138
Diurnal Loss:	0.019	0.018	0.031	0.022	0.036	0.000	0.000	0.000	0.006	0.019
Resting Loss:	0.128	0.119	0.206	0.141	0.216	0.000	0.000	0.000	0.379	0.128
Running Loss:	0.262	0.210	0.273	0.220	0.294	0.000	0.000	0.000	0.000	0.224
Crankcase Loss:	0.008	0.010	0.012	0.011	0.012	0.000	0.000	0.000	0.000	0.009
Refueling Loss:	0.093	0.157	0.122	0.174	0.318	0.000	0.000	0.000	0.000	0.126
Total Non-Exhaust:	0.667	0.634	0.938	0.714	1.148	0.000	0.000	0.000	0.494	0.645

Not all emissions occur on roadways!

Start Exhaust

- Associated with vehicle trip starts, in parking lots and neighborhoods

Running Exhaust and Running Loss

- Associated with roadway operation

Hot Soak and Diurnal Soak

- Associated with vehicle trip ends, in parking lots and neighborhoods

Refueling

- Associated with gas stations

Crankcase and Resting Loss

- Continuous (emitted at all times)
- Not assigned to roadways in MOBILE6

Contribution of Start and Evaporative Emissions

Starts:

- 17% of VOC
- 20% of NO_x
- 30% - 50% of CO

Evaporative (VOC only):

- Hot soak/diurnal soak (parked cars): 20%
- Exhaust/running loss (operating cars): 43%
- Resting loss/crankcase (continuous): 16%
- Refueling (gas stations): 4%

Dealing with Trips that Begin/End Outside the Area

In most areas, some portion of VMT is made up of trips that don't originate within the modeling area (external/internal and through trips)

This issue is especially important for rural & donut counties, with large amounts of through VMT, to consider.

Special consideration is needed to address different emissions characteristics of these trips:

- Start emissions
- Evaporative emissions

Why Is This An Issue?

Nearly all areas overestimate emissions by including emissions that aren't actually occurring in the area (by using the MOBILE6 composite emission rates)

If start and evap emissions are overestimated on through facilities (e.g., interstates), it makes it that much harder to demonstrate conformity in the future if interstate VMT grows significantly

Start Emissions

Trips that begin in another county don't have any start emissions in the nonattainment county, just running emissions (and some evaporative emissions)

If MOBILE6 start emissions rates are applied to all regional VMT, which is common practice, start emissions will be overcounted

Evaporative Emissions

Trips that end in the county don't have a start, but they do have hot soak/diurnal soak emissions

Trips that start in the county and end elsewhere do have start emissions, but not soak emissions

Through trips don't have start, soak or refueling emissions

Solutions

Model emissions for VMT from through trips separately:

- STARTS PER DAY set to zero
- Use “EXPAND EVAPORATIVE” and don’t include hot soak or diurnal soak emissions

Enhancement: Consider a similar approach for internal/external trips

Estimating Through and Internal/External VMT

Statewide Travel Model

Local Travel Model

Screenline Counts

Accident Data

Census Journey-to-Work Data

Start Emissions in Project-Level Analysis

Excess emissions from vehicle starts are no longer a factor after a minute or two of operation

- By the time a vehicle reaches a facility big enough to be evaluated in NEPA, starts are not a contributor to emission rates

Start emissions are easy to zero out in MOBILE6.2

Start Emissions in Project-Level Analysis

EPA recommends that modelers not include start emissions in CO hotspot analyses

Facilities near large parking lots (e.g., shopping malls, sports arenas) ARE influenced by start emissions, and this can be modeled too

- Recent ICF/FHWA report includes guidelines for modeling these types of locations

Special Considerations for Project-Level Analyses: Congested Vehicle Speeds

Estimating Vehicle Speeds for Use in MOBILE6.2

Why does speed matter?

MOBILE6.2 speed requirements

Project-level dispersion modeling requirements

Speed estimating methodologies

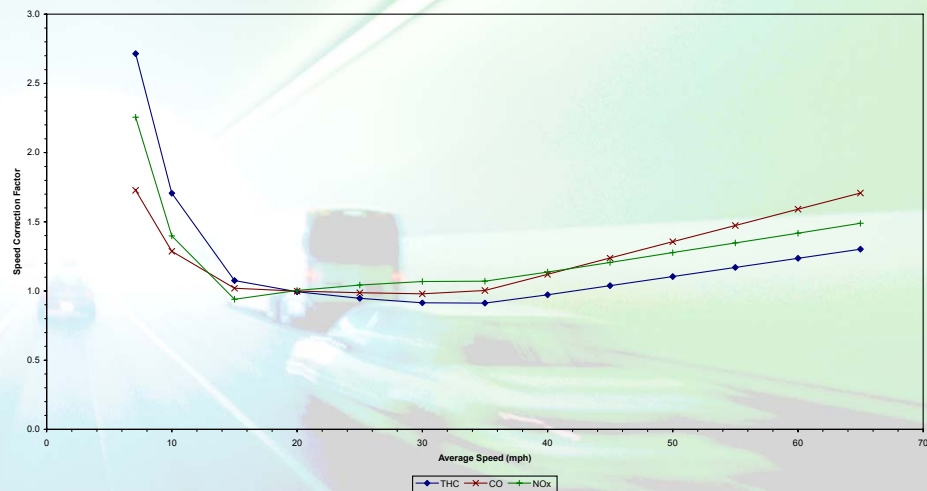
Computing mean speed

Why Speed Matters

MOBILE6.2 emission factors vary by vehicle speed

High emission factors for speeds < 15 mph and for speeds > 35 mph

MOBILE6.2 Speed Correction Factors for Freeways (Tier 1 Vehicles)



MOBILE6.2 Speed Requirements

Average speed by facility type

VMT by speed, hour, and facility



Average Speed by Facility Type

Locally-derived estimates of average speed for individual
roadway links separated into different functional classes

Accomplished using the AVERAGE SPEED command



VTM by Speed, Hour, and Facility

Provides the greatest level of detail when modeling emission variations over the course of a day

Locally-derived estimates of VMT by average speed by hour recommended if photochemical modeling is needed

Accomplished using the SPEED VMT command

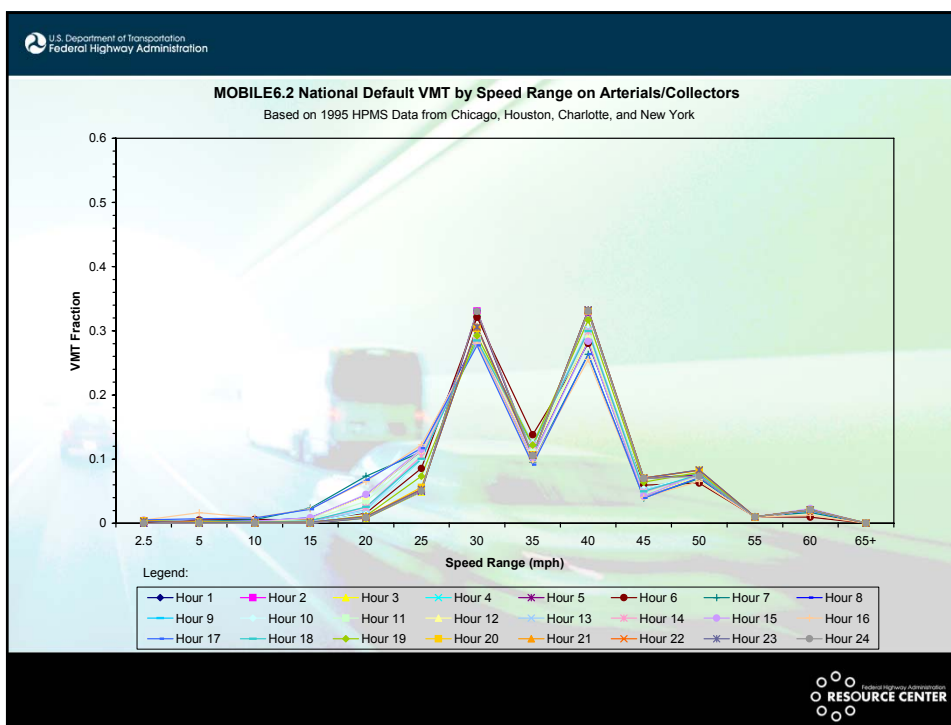
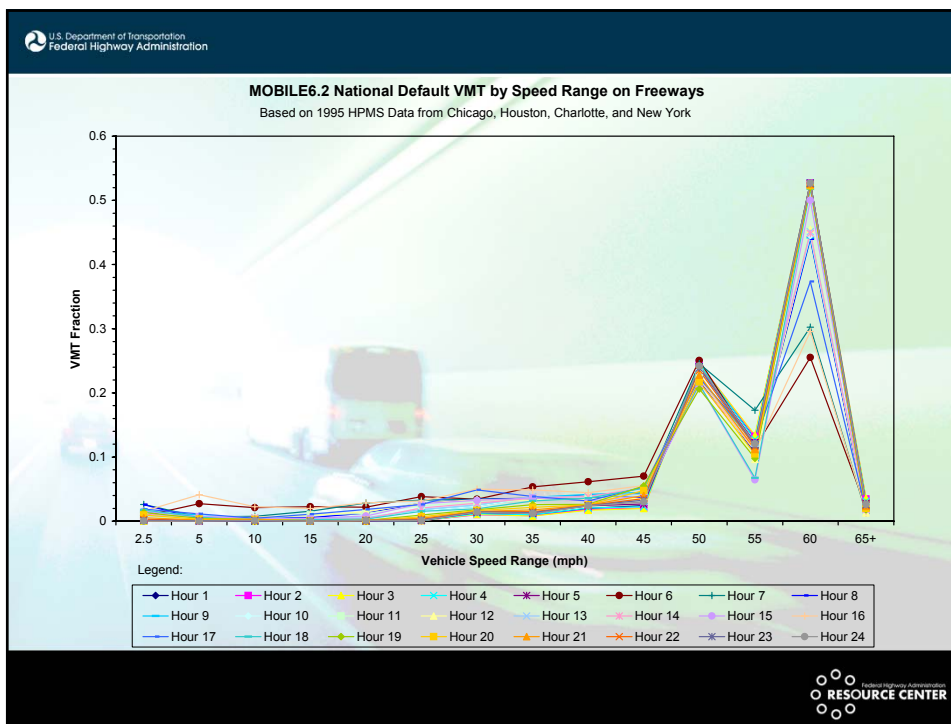
VTM fractions by 14 pre-defined speed bins for each hour in a day by freeway and arterial facility types (14 x 24 x 2 matrix)

For local roadways and freeway ramps, average speeds are fixed at 12.9 mph and 34.6 mph, respectively

VTM by Speed, Hour, and Facility (continued)

MOBILE6.2 Speed Bins

Bin Number	Abbreviation	Description
1	2.5 mph	Average Speeds 0 – 2.5 mph
2	5 mph	Average Speeds 2.5 – 7.5 mph
3	10 mph	Average Speeds 7.5 – 12.5 mph
4	15 mph	Average Speeds 12.5 – 17.5 mph
5	20 mph	Average Speeds 17.5 – 22.5 mph
6	25 mph	Average Speeds 22.5 – 27.5 mph
7	30 mph	Average Speeds 27.5 – 32.5 mph
8	35 mph	Average Speeds 32.5 – 37.5 mph
9	40 mph	Average Speeds 37.5 – 42.5 mph
10	45 mph	Average Speeds 42.5 – 47.5 mph
11	50 mph	Average Speeds 47.5 – 52.5 mph
12	55 mph	Average Speeds 52.5 – 57.5 mph
13	60 mph	Average Speeds 57.5 – 62.5 mph
14	65 mph	Average Speeds > 62.5 mph



Project-Level Dispersion Modeling Requirements

For modeling signalized intersections, emission factors separating the free-flow and idling operation of vehicles are used

For other applications, such as freeway travel, emission factors are based on the average link speed

Average speed is the trip distance in miles divided by the total travel time in hours

The average or congested speed includes all travel time spent in cruising, decelerating, stopping, and accelerating modes of vehicle over the link distance

Project-Level Dispersion Modeling Requirements (continued)

For project-level dispersion modeling, emission factors may be needed for:

- Congested vehicle speeds (highways without without intersections; emissions from an affected highway network)
- Free-flow vehicle speeds / idling vehicles at signalized intersections)

A typical procedure employed is to:

- Construct an emission factor look-up table for a range of vehicle speeds in set increments for freeways and arterials
- Calculate the link speed appropriate for the application (i.e., congested speed, free-flow speed, or idle)
- Select the applicable emission factor from the look-up table

Speed Estimating Methodologies

Congested and Free-Flow Speeds

- Updated Bureau of Public Roads (BPR) formula
- Texas Transportation Institute (TTI) method

Free-Flow Speeds

- CAL3QHC User's Guide
- Speed limit basis

BPR Formula

Estimates speeds based on the volume/capacity (V/C) ratio and the free-flow speed

The original BPR formula was developed in the 1960s; more recent modifications to the formula parameters can improve the accuracy of speed estimates

Reference – NCHRP Report 387, “Planning Techniques to Estimate Speeds and Service Volumes for Planning Applications”

BPR Formula (continued)

BPR-type formulas require: 1) free-flow speed; 2) traffic volume; and 3) roadway capacity

The updated BPR formula is

$$S = \frac{S_F}{1 + a \left(\frac{V}{C} \right)^b}$$

where: S is the predicted mean speed in mph;
 S_F is the free-flow speed in mph;
 V is the traffic volume in vehicles per hour or vehicles per day;
 C is the capacity in vehicles per hour or vehicles per day;
 a is 0.05 for facilities with signals spaced 2 mi apart or less and
 0.20 for all other facilities; and
 b is 10

BPR Formula (continued)

Free-flow speed estimation

- High-speed unsignalized facilities (posted speed > 50 mph)
- Low-speed unsignalized facilities (posted speed ≤ 50 mph)
- Signalized facilities
- OR based on look-up tables developed from default values in the "Highway Capacity Manual"

Example from NCHRP Report 387

Area	S_F , free-flow speed (mph)				
	Freeway	Expressway	Arterial	Collector	Local
CBD	50	45	40	35	30
Urban	55	50	45	40	35
Suburban	60	55	50	45	40
Rural	65	60	55	50	45

BPR Formula (continued)

Roadway capacity estimation

- Freeways and unsignalized multilane roads
- 2-lane unsignalized roads
- Signalized arterials
- OR based on look-up tables developed from default values in the “Highway Capacity Manual”

Example from NCHRP Report 387

Area	C, one-way LOS C capacities, vehicles per hour per lane				
	Freeway	Expressway	2-way Arterial (w/parking)	1-way Arterial (w/parking)	2-way Arterial (no parking)
CBD	1750	800	600	700	600
Fringe	1750	1000	550	550	800
Outer CBD	1750	1000	550	650	800
Rural	1750	1000	550	900	800

TTI Method

Estimates aggregate average speeds (congested speeds) by functional class, time-of-day period, and direction of travel

Reference – “Development of On-Road Mobile Source Emissions” by George B. Dresser and Dennis G. Perkinson, Texas Transportation Institute, presented at the 10th Annual Emission Inventory Conference: Inventories for Rural Counties, May 2001

$$\text{Congested Speed} = \frac{60}{\frac{60}{\text{Freeflow Speed}} + \text{Delay}}$$

(Speeds in mph)

TTI Method (continued)

Default Freeflow speed:

HPMS Area Type	HPMS Roadway Functional Classification						
	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Rural	70	65	55	50	40	35	30
Small Urban	70	65	45	40	35	30	30
Urban	70	65	40	35	30	30	30

TTI Method (continued)

$$\text{Delay} = \text{Minimum} \left[A \times e^{B \left(\frac{V}{C} \right)}, M \right]$$

where: Delay is the congestion delay in minutes per mile;
A and B are volume/delay equation coefficients;
M is the maximum minutes of delay per mile; and
V/C is the time of day directional volume/capacity ratio.

Facility Category	Parameter		
	A	B	M
High Capacity Facilities (> 3400 vehicles per hour, e.g., Interstates and Freeways)	0.015	4.2	5.0
Low Capacity Facilities (< 3400 vehicles per hour, e.g., Arterials, Collectors and Locals)	0.050	3.9	6.0

TTI Method (continued)

Default hourly lane capacities (C):

HPMS Area Type	HPMS Roadway Functional Classification						
	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Rural	2200	2100	1003	920	836	669	502
Small Urban	2200	2100	878	805	732	585	439
Urban	2200	2100	673	617	561	448	336

Free-Flow Speeds from CAL3QHC User's Guide

Free-Flow Speeds (mph) for Arterials

(Source: 1985 Highway Capacity Manual, Chapter 11)

	Arterial Class		
	I	II	III
Range	35 to 45	30 to 35	25 to 30
Typical	40	33	27

Free-Flow Speeds from CAL3QHC User's Guide (continued)

Arterial Class According to Function and Design Category

(Source: 1985 Highway Capacity Manual, Chapter 11)

Design Category	Functional Category	
	Principal Arterial	Minor Arterial
Suburban	I	II
Suburban/Urban	II	III
Urban	III	III

Free-Flow Speeds Based on Link Speed Limit

- Free-Flow Speed = Speed Limit + 5 mph
- Free-Flow Speed = Speed Limit \times 1.10

Computing Mean Speed

Vehicle speed is a rate – distance / time

A simple average of vehicle speeds doesn't give the true mean speed of all vehicles

EPA prefers using the space mean speed or harmonic mean of the speeds when computing the appropriate speed for use in the MOBILE6.2 AVERAGE SPEED command (refer to the MOBILE6.2 user's manual).

Computing Mean Speed (continued)

The time mean speed or arithmetic mean of the speeds may be a biased estimator of average speed because more high-speed vehicles than slow-speed vehicles will pass a given point during a fixed time. Consequently, high-speed vehicles are given a disproportionate weight in the average.

To compute a harmonic mean speed (\bar{s}), speeds in the sample (s_i) are weighted by the VMT fraction ($VMTf_i$):

$$\bar{s} = \frac{1}{\sum_i \frac{VMTf_i}{s_i}}$$

Computing Mean Speed (continued)

If there is no difference in vehicle speeds in the sample, then the harmonic and arithmetic mean speeds are identical.

The greater the difference in vehicle speeds, the greater the difference between the harmonic and arithmetic mean speeds.

Special Considerations for Project-Level Analyses: Mobile Source Air Toxics

Outline of FHWA Guidance

Guidance memo

Appendix A: Sample language for exempt projects

Appendix B: Sample language for qualitative analysis

Appendix C: Sample 1502.22 compliance language

Appendix D: Background

- Attachment A: List of MSAT compounds
- Attachment B: FHWA Research Activities
- Attachment C: 40 CFR 1502.22

Appendix E: MSAT mitigation strategies

MSAT Analysis Quick-Start Guide

Define affected transportation network

All project links, plus other links where volumes change by +/- 5% as a result of the project

Calculate VMT on these links

Define other travel activity parameters

Roadway capacities, hourly speeds

Calculate emission factors with MOBILE6.2

Calculate total emissions for each alternative

Mobile Source Air Toxics (MSAT) Analysis Quick-Start Guide

This guide serves as quick overview of the MSAT emissions analysis process. It progresses through the necessary steps, and provides cross-references to the FHWA MSAT workshop materials, which contain additional guidance and technical information. If you have questions on this material, contact Michael Claggett or Jeff Houk with the Federal Highway Administration (FHWA) Resource Center Air Quality Team (contact information is provided below).

Disclaimer: This does not constitute official technical guidance, but reflects our view of a reasonable technical approach, and the approach we use when we conduct analysis. Other approaches may be possible.

Step 1 – Identify the affected transportation network

The simplest scope of analysis is to only calculate emissions for those roadway segments that would be constructed as part of the project. But in order to better capture the MSAT emissions that would be generated as a result of implementing the project, it's best to define an affected transportation network. This would include the constructed roadway segments, as well as other links where traffic volumes are expected to change as a result of the project.

As a practical consideration, a volume change threshold needs to be adopted as the basis for including or excluding links in the affected transportation network. One suggested threshold is a plus or minus five percent change in volumes (rounded to the nearest per cent). Interagency consultation partners may conclude that higher or lower thresholds are appropriate; the key is that these thresholds be applied consistently for all analysis years and project alternatives. (FHWA is not suggesting that areas must develop a separate new traffic analysis methodology strictly for MSAT analysis. Areas will generally need to work with the information they have already developed for other purposes. For very large corridor projects, it may be easier to simply run the regional travel model than to identify a project network.)

Analysts may find that this step results in different affected networks for different alternatives. In cases like this, some analysts prefer to consolidate the networks so that the same roadway links are analyzed for all alternatives, while others prefer to maintain distinct networks for each alternative. Distinct networks allow for the most accurate comparison of percentage differences in emissions between each alternative and No Action, while consolidating the networks facilitates direct comparison of alternatives to each other. Distinct networks may also be a better approach when a project involves alternatives in significantly different geographic locations (alignments) that would affect different populations.

For more information on this step, see pages 75-77 of the MSAT Workshop Materials. Also, for an actual example, see the “Class Exercise” and “Step 1” tabs of the spreadsheet “Class Exercise.xls”.

Step 2 – Calculate VMT

The next step is to calculate vehicle miles of travel (VMT) for each of the links in the affected transportation network. VMT is the product of traffic volume and segment length. This will be used later in the emissions calculations. VMT may be calculated on a daily basis, for peak and off-peak, or hourly, depending on how speeds are calculated (see below).

See page 78 of the MSAT Workshop Materials and the “Step 2” tab of the spreadsheet “Class Exercise.xls”.

Step 3 – Add parameters to characterize travel activity

The next step is to calculate speeds for the individual links in the affected transportation network, and to identify other travel parameters that might affect emissions and thus should be reflected in MOBILE6.2 modeling. One important parameter is facility type, since MOBILE6.2 calculates emissions factors separately for four different facility types (freeway, arterial, local and ramp), and the speed equations (discussed below) are dependent on facility type. Also important for modeling emissions are VMT fractions (fractions of cars, light trucks, heavy trucks, etc.), which may be different for different roadway links or facility types (depending on available information).

The FHWA workshop relies on a Texas Transportation Institute (TTI) methodology for calculating congested speeds, based on anticipated volumes and capacity. Project alternatives will affect capacity and may also affect volumes. For un-congested situations (in both Build and No Action), daily average speeds may suffice. However, for congestion relief projects, analysts should at least model peak and off-peak speeds, and ideally, hourly speeds. If hourly counts are unavailable for the roadways in question, the MOBILE6.2 default VMT BY HOUR fractions can be used to disaggregate annual average daily traffic volumes (AADT) into hourly traffic volumes for purposes of hourly speed calculations.

The reason for this can be traced to the relationship between emissions and speeds in the MOBILE6.2 model. An “emissions vs. speed” graph for most of the MSATs would look like a hockey stick, with a sharp decline in emissions between 2.5 and 20 mph, and a more gradual decline after that. Thus, it is important to capture the improvements in speeds during congested hours in order to fully reflect the MSAT benefits of reducing congestion. An analysis that uses peak and off-peak speeds, or hourly speeds, will show a larger decline in MSAT emissions between No Action and Build than an analysis that uses daily average speeds. (For the same reason, it might be useful to look at directional speeds, although no one to our knowledge has done this yet for project analysis.)

See pages 79-82 of the MSAT Workshop Materials and the “Step 3” tab of the spreadsheet “Class Exercise.xls”. The TTI equations presented in the workshop materials are also used in the spreadsheet. Note that this example analysis is only for

one peak hour—in a real analysis, it would be repeated for the remaining hours/time periods of the day.

Step 4 – Predict MSAT emission factors

MOBILE6.2 is used to calculate MSAT emission factors for each individual combination of facility type, speeds, and VMT fractions identified in the previous steps. For projects with a very large number of links, it may be more efficient to generate “look-up” tables in MOBILE6.2 for a range of speeds by facility type and VMT fractions. Suggested analysis years are a present-day baseline, opening day, and the design year.

Since MSAT health concerns in the transportation context are related to chronic exposures, the MOBILE6.2 model inputs should reflect annual average conditions – similar to modeling conducted for conformity or State Implementation Plan (SIP) development purposes for particulate matter of size $\leq 2.5 \mu\text{m}$ (PM_{2.5}). These would include annual average temperatures, fuel parameters, etc. Like PM_{2.5}, it is possible to use either an annual average, seasonal, or monthly approach; however, since the goal is to generate emissions estimates only for comparison of alternatives and No Action, an annual average approach may be all that is really necessary.

Diesel particulate matter (DPM) emission factors are not calculated directly by the model. Users need to multiply the “Total Exhaust PM” emission factor for each of the diesel vehicle classes (LDDV, LDDT, and HDDV) by the corresponding VMT fraction, and sum the results. This will result in a VMT-weighted composite DPM emission factor. Note that the DPM emission factor will not change with speed or facility type, unlike the factors for the other MSATs.

Pages 86-153 of the MSAT Workshop Materials provide guidance on MOBILE6.2 MSAT modeling. Pages 145-153 are a MOBILE6.2 Implementation Summary table that presents all of the relevant commands and data sources in table format. Pages 83-84 of the workshop materials and the “Step 4” tab of the spreadsheet “Class Exercise.xls” show how the modeled emissions rates are factored into the analysis. The “Class Exercise” folder also includes the actual MOBILE6.2 input and output files used in this example. Note that this example uses local inputs specific to Denver, so other data would need to be substituted in other locations.

Step 5 – Compute MSAT emissions

Once emissions factors are generated with MOBILE6.2, calculating emissions is a simple matter of multiplying VMT for each link by the speed-specific emissions factor for each link, and then summing all the links. Pay attention to units—the diesel particulate emissions factor will be in grams per mile (or g/VMT), while the emissions factors for the other MSATs are reported in milligrams per mile (or mg/VMT).

See pages 84-85 of the MSAT Workshop Materials and the “Step 5” tab of the spreadsheet “Class Exercise.xls”.

If you have additional questions, please contact:



JEFF HOUK
Air Quality Specialist

FHWA Resource Center
12300 West Dakota Avenue
Lakewood, CO 80228
Suite 340
Phone: 720.963.3203
Fax: 720.963.3232
Cell: 303.434.1376
jeff.houk@fhwa.dot.gov
www.fhwa.dot.gov/resourcecenter



MICHAEL CLAGGETT
Ph.D., Air Quality Modeling
Specialist

FHWA Resource Center
12300 West Dakota Avenue
Suite 340
Lakewood, CO 80228
Phone: 720.963.3201
Fax: 720.963.3232
Cell: 303.434.1378
michael.claggett@fhwa.dot.gov
www.fhwa.dot.gov/resourcecenter

Easy Mobile Inventory Tool (EMIT)

Design Team

Robert O'Loughlin

Air Quality Technical Service Team Leader

John Byun, Ph.D.

Air Quality Modeling Spec.

Michael Roberts

Air Quality Specialist

Jeffery Houk

Air Quality Specialist

Michael Claggett, Ph.D.

Air Quality Modeling Spec.

Karen Perritt

Air Quality Specialist

Kevin Black

Air Quality Specialist

Acknowledgements

George Dresser and Jason Crawford
Texas Transportation Institute

**National Highway Institute Course “Estimating Regional
Mobile Source Emissions”**

What is EMIT?

**EMIT is a tool to simplify the development of mobile source
emission factors and emission inventories for:**

***Project-level highway air quality assessments
Conformity determinations in rural and small urban areas***

EMIT does not change MOBILE6.2, but provides an easy way to:

***Enter data into MOBILE6.2
Calculate speeds in areas without travel models
Calculate and summarize on-road mobile source emissions***

Key Functions

Integrate the emission factor / emission inventory processing steps into one software package operating in a Microsoft® Windows® environment

Incorporate a graphical user interface to MOBILE6.2 allowing the implementation of those locale-specific parameters addressed in EPA's technical guidance

- External conditions
- Vehicle fleet characteristics
- Vehicle activity
- Vehicle fuel specifications
- State programs

Data Forms

**Data entered via forms
organized by:**

1. Basic MOBILE6.2 data
2. MOBILE6.2 fuel options/state programs
3. Monthly (or hourly) MOBILE6.2 data
4. HPMS data

[illegible]

Extended Functionality

Offers three operating modes:

1. Compute mobile source emission inventories
2. Graphical user interface for MOBILE6.2
3. Construct speed look-up tables of emission factors

Provides results summaries for:

1. CO
2. HC / NO_x
3. PM-10
4. PM-2.5 plus precursors
5. MSATs

Extended Functionality (continued)

Optional interpolation schemes to produce long-term emission estimates:

1. Annual
2. Winter / Summer
3. Winter / Summer / Winter
4. Winter / Summer / Spring / Fall
5. Month-by-Month

Capable of processing HPMS data summaries or highway link data to generate speed VMT and facility VMT files used by the MOBILE6.2 model

Extended Functionality (continued)

Conducts data quality assurance/quality control checks

1. Missing data
2. Valid number verification
3. Out of range values

Speeds in EMIT

EMIT can process user-provided HPMS data summaries or highway link data to calculate speeds by road type

Speeds can be refined by hour, by direction of travel, and by day of week, season, or month

Users can choose between Bureau of Public Road or Texas Transportation Institute speed methodologies, and rely on default speed calculation parameters or input local factors

EMIT Processing Steps

1. **User enters locale-specific data**
 - If constructing mobile source emission inventories, VMT data are entered based on FHWA's Highway Performance Monitoring System (HPMS)
2. **For emission inventories, congested vehicle speeds are calculated and VMT is distributed by facility type using locale-specific HPMS data**
3. **A MOBILE6.2 input file is created incorporating user inputs and any processed HPMS data**
4. **MOBILE6.2 runs**

EMIT Inventory Processing Steps (continued)

5. **Resulting MOBILE6.2 emission factors are determined and any HPMS VMT data are used to calculate total emissions**
6. **Reports generated:**
 - a) Summary table – travel activity and emissions by MOBILE6.2 facility type
 - b) Emissions chart
 - c) MOBILE6.2 printout

EMIT Limitations

Only one calendar year can be modeled at a time

EMIT does not facilitate several MOBILE6.2 inputs (commands where EPA recommends use of defaults), including:

- Air conditioning inputs (peak sun, sunrise/sunset, cloud cover)
- Mileage accumulation rate
- Diesel fractions
- Soak and trip length distributions
- Pre-2000 gasoline sulfur content

Standard MOBILE6.2 Operation – Example Data File

```
example9 - Notepad
File Edit Format View Help
MOBILE6 INPUT FILE
PARTICULATES :
AIR TOXICS :
POLLUTANTS : HC CO NOX
SPREADSHEET :
RUN DATA :

>Example Run - Tests All M6.2 Pollutant Types
#
EXPRESS HC AS VOC :
EXPAND EVAP :

SCENARIO REC : Example Input File
#
CALENDAR YEAR : 2002
#
SULFUR CONTENT : 30.0
MIN/MAX TEMP : 68.0 84.0
FUEL RVP : 7.0

PARTICLE SIZE : 10.0
PARTICULATE EF : PMG2ML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR : 500.0

GAS AROMATIC% : 25.0
GAS OLEFIN% : 15.0
GAS BENZENES : 1.5
E200 : 50.0
E300 : 85.0
OXYGENATE : MTBE 15.1 0.50
: ETBE 17.6 0.05
: ETOH 10.0 0.45
: TAME 6.0 0.00
ADDITIONAL HAPS : HAP_BASE.CSV

END OF RUN :
```

Standard MOBILE6.2 Operation – Command Prompt

```

Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>cd
D:\>cd
C:\>cd \mobile6\run
C:\mobile6\run>cd ..
C:\mobile6>cd run
C:\mobile6\run>mobile62

32-bit Power for Lahey Computer Systems
Phar Lap's 386 iDOS-Extender(tm) Version 8.02
Copyright (C) 1986-96 Phar Lap Software, Inc.
Available Memory = 15356 Kb

MOBILE6.2.03 (24-Sep-2003)
Enter the name of the Mobile6 input file:
barebone
Input file name: BAREBONE.IN
Processing start time is 15:36:40.470.
* Report file: BAREBONE.TXT
Reading information.
Performing calculations.
Preparing output.
Run # 1, INERR = 0

DRIVER calls completed.
Processing end time is 15:36:42.230.
The total run time is 0 hrs., 0 minutes, and 2 seconds.
C:\mobile6\run>

```

Standard MOBILE6.2 Operation – Example Output

EXAMPLE9 - Notepad

File Edit Format View Help

Calendar Year: 2002
Month: Jan.
Altitude: Low
Minimum Temperature: 68.0 (F)
Maximum Temperature: 84.0 (F)
Absolute Humidity: 75. grains/lb
Nominal Fuel RVP: 7.0 psi
Weathered KVP: 7.0 psi
Fuel Sulfur Content: 279. ppm
Exhaust I/M Program: No
Evap I/M Program: No
AIP Program: No
Reformulated Gas: NA (See Air Toxics Output)

Ether blend market share: 0.550 Alcohol blend market share: 0.450
Ether blend Oxygen Content: 0.027 Alcohol blend Oxygen Content: 0.035
Alcohol blend RVP waiver: No

Vehicle Type:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDDV	LDGV	LDGT	HDDV	MC	All Veh
WMT Distribution:	0.4638	0.3052	0.1042		0.0357	0.0008	0.0017	0.0827	0.0060	1.0000
Composite Emission Factors (g/mi):										
Composite VOC:	1.378	1.580	2.531	1.822	2.115	0.727	0.983	0.710	2.14	1.534
Composite CO:	14.10	17.32	25.48	19.39	19.82	1.713	1.704	3.687	11.77	15.568
Composite NOx:	1.172	1.252	1.745	1.452	5.137	1.650	1.699	16.061	1.23	2.661
Non-Exhaust Emissions (g/mi):										
Hot Soak Loss:	0.157	0.119	0.193	0.138	0.212	0.000	0.000	0.000	0.109	0.138
Drift Loss:	0.019	0.018	0.021	0.022	0.036	0.000	0.000	0.000	0.006	0.019
Resting Loss:	0.128	0.119	0.206	0.111	0.216	0.000	0.000	0.000	0.379	0.128
Running Loss:	0.262	0.210	0.275	0.226	0.294	0.000	0.000	0.000	0.000	0.224
Crankcase Loss:	0.008	0.010	0.012	0.011	0.012	0.000	0.000	0.000	0.000	0.009
Refueling Loss:	0.092	0.157	0.222	0.174	0.238	0.000	0.000	0.000	0.000	0.126
Total Non-Exhaust:	0.667	0.634	0.958	0.714	1.148	0.000	0.000	0.000	0.494	0.645

Ln 1, Col 1

Basic MOBILE6.2 Data Managed by EMIT

STEP 1: Enter Basic MOBILE6.2 Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help

Basic MS Fuel/State Monthly MS HPMS Calculate Results File Exit About

Run Description (Optional)

EMIT Mode of Operation

Inventory Calculation MOBILE6.2 Interface Speed Look-Up Table

Basic MOBILE6.2 Data

Pollutant(s):

CO HC/NOx PM-10 PM-2.5 MSATs

Calendar Year:

January July Seasonal

Evaluation Month:

None

Interpolation Scheme:

Low High

Altitude:

REGDATA.D

File of Age Distribution of Vehicle Registrations:

REGDATA.D

File of VMT Fraction by Vehicle Class:

LDT1: LDT2: LDT3:

LDT4: HDV2B: HDV3: HDV4:

HDV5: HDV6: HDV7: HDV8:

HDV9: HDV10: HDV11: HDV12:

HDV13: HDV14: HDV15: HDV16:

HDV17: HDV18: HDV19: HDV20:

HDV21: HDV22: HDV23: HDV24:

HDV25: HDV26: HDV27: HDV28:

HDV29: HDV30: HDV31: HDV32:

HDV33: HDV34: HDV35: HDV36:

HDV37: HDV38: HDV39: HDV40:

HDV41: HDV42: HDV43: HDV44:

HDV45: HDV46: HDV47: HDV48:

HDV49: HDV50: HDV51: HDV52:

HDV53: HDV54: HDV55: HDV56:

HDV57: HDV58: HDV59: HDV60:

HDV61: HDV62: HDV63: HDV64:

HDV65: HDV66: HDV67: HDV68:

HDV69: HDV70: HDV71: HDV72:

HDV73: HDV74: HDV75: HDV76:

HDV77: HDV78: HDV79: HDV80:

HDV81: HDV82: HDV83: HDV84:

HDV85: HDV86: HDV87: HDV88:

HDV89: HDV90: HDV91: HDV92:

HDV93: HDV94: HDV95: HDV96:

HDV97: HDV98: HDV99: HDV100:

Clear VMT Fractions by Vehicle Class

File of VMT Fraction by Hour of the Day:

SVMT.D

File of Vehicle Engine Starts per Day:

STPERDAY.D

File of Vehicle Engine Starts by Hour of the Day:

SDST.D

File of VMT Fraction by Average Speed:

SVMT.D

STATUS

Inventory Calculation

MOBILE6.2 Interface

Speed Look-Up Table

U.S. Department of Transportation

Federal Highway Administration

STEP 1: Enter Basic MOBILE6.2 Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help

Basic MS Fuel/State Monthly MS HPMS Calculate Results File Exit About

Run Description (Optional)

EMIT Mode of Operation

Inventory Calculation MOBILE6.2 Interface Speed Look-Up Table

Basic MOBILE6.2 Data

Pollutant(s):

CO HC/NOx PM-10 PM-2.5 MSATs

Calendar Year:

January July Seasonal

Evaluation Month:

None

Interpolation Scheme:

Low High

Altitude:

REGDATA.D

File of Age Distribution of Vehicle Registrations:

REGDATA.D

File of VMT Fraction by Vehicle Class:

LDT1: LDT2: LDT3:

LDT4: HDV2B: HDV3: HDV4:

HDV5: HDV6: HDV7: HDV8:

HDV9: HDV10: HDV11: HDV12:

HDV13: HDV14: HDV15: HDV16:

HDV17: HDV18: HDV19: HDV20:

HDV21: HDV22: HDV23: HDV24:

HDV25: HDV26: HDV27: HDV28:

HDV29: HDV30: HDV31: HDV32:

HDV33: HDV34: HDV35: HDV36:

HDV37: HDV38: HDV39: HDV40:

HDV41: HDV42: HDV43: HDV44:

HDV45: HDV46: HDV47: HDV48:

HDV49: HDV50: HDV51: HDV52:

HDV53: HDV54: HDV55: HDV56:

HDV57: HDV58: HDV59: HDV60:

HDV61: HDV62: HDV63: HDV64:

HDV65: HDV66: HDV67: HDV68:

HDV69: HDV70: HDV71: HDV72:

HDV73: HDV74: HDV75: HDV76:

HDV77: HDV78: HDV79: HDV80:

HDV81: HDV82: HDV83: HDV84:

HDV85: HDV86: HDV87: HDV88:

HDV89: HDV90: HDV91: HDV92:

HDV93: HDV94: HDV95: HDV96:

HDV97: HDV98: HDV99: HDV100:

Clear VMT Fractions by Vehicle Class

File of VMT Fraction by Hour of the Day:

SVMT.D

File of Vehicle Engine Starts per Day:

STPERDAY.D

File of Vehicle Engine Starts by Hour of the Day:

SDST.D

File of VMT Fraction by Average Speed:

SVMT.D

STATUS

Inventory Calculation

MOBILE6.2 Interface

Speed Look-Up Table

U.S. Department of Transportation

Federal Highway Administration

U.S. Department of Transportation
Federal Highway Administration
RESOURCE CENTER

U.S. Department of Transportation
Federal Highway Administration

Basic MOBILE6.2 Data Managed by EMIT

STEP 1: Enter Basic MOBILE6.2 Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help

Basic MS Fuel/State Monthly MS HPMS Calculate Results File Exit About

Run Description (Optional)

EMIT Mode of Operation

Inventory Calculation MOBILE6.2 Interface Speed Look-Up Table

Basic MOBILE6.2 Data

Pollutant(s):

CO HC/NOx PM-10 PM-2.5 MSATs

Calendar Year:

January July Seasonal

Evaluation Month:

None

Interpolation Scheme:

Low High

Altitude:

REGDATA.D

File of Age Distribution of Vehicle Registrations:

REGDATA.D

File of VMT Fraction by Vehicle Class:

LDT1: LDT2: LDT3:

LDT4: HDV2B: HDV3: HDV4:

HDV5: HDV6: HDV7: HDV8:

HDV9: HDV10: HDV11: HDV12:

HDV13: HDV14: HDV15: HDV16:

HDV17: HDV18: HDV19: HDV20:

HDV21: HDV22: HDV23: HDV24:

HDV25: HDV26: HDV27: HDV28:

HDV29: HDV30: HDV31: HDV32:

HDV33: HDV34: HDV35: HDV36:

HDV37: HDV38: HDV39: HDV40:

HDV41: HDV42: HDV43: HDV44:

HDV45: HDV46: HDV47: HDV48:

HDV49: HDV50: HDV51: HDV52:

HDV53: HDV54: HDV55: HDV56:

HDV57: HDV58: HDV59: HDV60:

HDV61: HDV62: HDV63: HDV64:

HDV65: HDV66: HDV67: HDV68:

HDV69: HDV70: HDV71: HDV72:

HDV73: HDV74: HDV75: HDV76:

HDV77: HDV78: HDV79: HDV80:

HDV81: HDV82: HDV83: HDV84:

HDV85: HDV86: HDV87: HDV88:

HDV89: HDV90: HDV91: HDV92:

HDV93: HDV94: HDV95: HDV96:

HDV97: HDV98: HDV99: HDV100:

Clear VMT Fractions by Vehicle Class

File of VMT Fraction by Hour of the Day:

SVMT.D

File of Vehicle Engine Starts per Day:

STPERDAY.D

File of Vehicle Engine Starts by Hour of the Day:

SDST.D

File of VMT Fraction by Average Speed:

SVMT.D

STATUS

Inventory Calculation

MOBILE6.2 Interface

Speed Look-Up Table

U.S. Department of Transportation

Federal Highway Administration

STEP 1: Enter Basic MOBILE6.2 Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help

Basic MS Fuel/State Monthly MS HPMS Calculate Results File Exit About

Run Description (Optional)

EMIT Mode of Operation

Inventory Calculation MOBILE6.2 Interface Speed Look-Up Table

Basic MOBILE6.2 Data

Pollutant(s):

CO HC/NOx PM-10 PM-2.5 MSATs

Calendar Year:

January July Seasonal

Evaluation Month:

None

Interpolation Scheme:

Low High

Altitude:

REGDATA.D

File of Age Distribution of Vehicle Registrations:

REGDATA.D

File of VMT Fraction by Vehicle Class:

LDT1: LDT2: LDT3:

LDT4: HDV2B: HDV3: HDV4:

HDV5: HDV6: HDV7: HDV8:

HDV9: HDV10: HDV11: HDV12:

HDV13: HDV14: HDV15: HDV16:

HDV17: HDV18: HDV19: HDV20:

HDV21: HDV22: HDV23: HDV24:

HDV25: HDV26: HDV27: HDV28:

HDV29: HDV30: HDV31: HDV32:

HDV33: HDV34: HDV35: HDV36:

HDV37: HDV38: HDV39: HDV40:

HDV41: HDV42: HDV43: HDV44:

HDV45: HDV46: HDV47: HDV48:

HDV49: HDV50: HDV51: HDV52:

HDV53: HDV54: HDV55: HDV56:

HDV57: HDV58: HDV59: HDV60:

HDV61: HDV62: HDV63: HDV64:

HDV65: HDV66: HDV67: HDV68:

HDV69: HDV70: HDV71: HDV72:

HDV73: HDV74: HDV75: HDV76:

HDV77: HDV78: HDV79: HDV80:

HDV81: HDV82: HDV83: HDV84:

HDV85: HDV86: HDV87: HDV88:

HDV89: HDV90: HDV91: HDV92:

HDV93: HDV94: HDV95: HDV96:

HDV97: HDV98: HDV99: HDV100:

Clear VMT Fractions by Vehicle Class

File of VMT Fraction by Hour of the Day:

SVMT.D

File of Vehicle Engine Starts per Day:

STPERDAY.D

File of Vehicle Engine Starts by Hour of the Day:

SDST.D

File of VMT Fraction by Average Speed:

SVMT.D

STATUS

Inventory Calculation

MOBILE6.2 Interface

Speed Look-Up Table

U.S. Department of Transportation

Federal Highway Administration

U.S. Department of Transportation
Federal Highway Administration
RESOURCE CENTER

99 of 144

Monthly MOBILE6.2 Data Managed by EMIT

Hourly MOBILE6.2 Data Managed by EMIT

STEP 3: Enter Month-by-Month MOBILE-2 Data | EMIT - Easy MOBILE-1...

Hourly MOBILE-2 Data | EMIT - Easy MOBILE Inventory Tool

Hourly MOBILE-2 Data

MOBILE-2 Hour	Clock Time	Temperature, °F	Relative humidity, %
1	6 am - 7 am		
2	7 am - 8 am		
3	8 am - 9 am		
4	9 am - 10 am		
5	10 am - 11 am		
6	11 am - 12 n		
7	12 n - 1 pm		
8	1 pm - 2 pm		
9	2 pm - 3 pm		
10	3 pm - 4 pm		
11	4 pm - 5 pm		
12	5 pm - 6 pm		
13	6 pm - 7 pm		
14	7 pm - 8 pm		
15	8 pm - 9 pm		
16	9 pm - 10 pm		
17	10 pm - 11 pm		
18	11 pm - 12 m		
19	12 m - 1 am		
20	1 am - 2 am		
21	2 am - 3 am		
22	3 am - 4 am		
23	4 am - 5 am		
24	5 am - 6 am		

Day Average Barometric Pressure, in. Hg: 29.62

STATUS

- No Pollutant
- No Calendar Year
- No Event Month
- No Year-2 / RFS
- No LRA Program
- No ATR
- No Nox Max Temp
- No Fuel RVP
- No Speed Process
- No HPI Vday

U.S. Department of Transportation
Federal Highway Administration

HPMS Data Managed by EMIT

STEP 4: Enter HPMS Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help HPMS Calculation Results File Exit About

Basic MS Fuel/State Monthly MS HPMS Calculation Results File Exit About

Run Description (Optional)

Seasonal MSATs

Vehicle Speed Processing

☐ Bureau of Public Roads (BPR) Formula ☐ Texas Transportation Institute (TTI) Method

☐ Each Hour of the Day ☐ Each Direction of Travel

Format of Highway Network Information: ☐ HPMS Summary ☒ Link-by-Link

HPMS Summary

Rural Small Urban Urbanized Large Urbanized

Functional Classification	Ramp %	VMT per day	Lane-Miles	VMT Forecast Factor (for Future Year)
Interstate				
Other Principal Arterial				
Minor Arterial				
Major Collector				
Minor Collector				
Local				

VMT Adjustment Factor by Season:

Winter: Spring: Summer: Fall:

Inventory Calc: HPMS Summary
Calendar: No. 2008
Season: WY 2008
TSP: 25 East
No LHM Program
No HSP
No HSP/MS Temp
No Fuel/MS
No VMT/MS
No VMT/MS
Hourly TTI Speeds

U.S. Department of Transportation
Federal Highway Administration

Changing Speed Calculation Parameters in EMIT

STEP 4: Enter HPMS Data | EMIT - Easy MOBILE Inventory Tool

File Edit Help HPMS Calculation Results File Exit About

Basic MS Fuel/State Monthly MS HPMS Calculation Results File Exit About

Run Description (Optional)

Seasonal MSATs

Change Speed Calculation Parameters (TTI Method) | EMIT - Easy MOBILE Inventory Tool

TTI Method Speed Calculation Parameters by Area Type

Rural Small Urban Urbanized Large Urbanized

Functional Classification	SF (mph)	C (mph)	M (min/mi)	A	B
Interstate	55	2200	5	0.015	4.2
Other Principal Arterial	50	1000	6	0.05	3.9
Minor Arterial	40	920	6	0.05	3.9
Major Collector	35	836	6	0.05	3.9
Minor Collector	30	669	6	0.05	3.9
Local	30	562	6	0.05	3.9

Local

VMT Adjustment Factor by Season:

Winter: Spring: Summer: Fall:

File of Highway Network Link Data:

U.S. Department of Transportation
Federal Highway Administration

HPMS versus MOBILE6.2 Roadway Types

HPMS Functional Classification	MOBILE6.2 Roadway Scenario
Rural Interstate	Freeway and Freeway Ramp
Rural Other Principal Arterial	
Rural Minor Arterial	Arterial/Collector
Rural Major Collector	
Rural Minor Collector	
Rural Local	
Urban Interstate	Freeway and Freeway Ramp
Urban Other Freeways	
Urban Other Principal Arterial	Arterial/Collector
Urban Minor Arterial	
Urban Collector	
Urban Local	Local

Summary Table of Results in EMIT

STEP 6: View Results Table | EMIT - Easy Mobile Inventory Tool

File Edit View Help

Basic MB Fuel/State Monthly MB HPMS Calculate Results File Exit About

Run Description
Example PM-2.5 Emission Inventory

Emission Inventory Results

PM2.5 NOx HC NPD SO2

MOBILE6.2 Facility Type

Month Parameter Freeway Arterial Local Ramp Start/Day Total Emissions (tpy)

January EF (g/vmt) 0.0143 0.0143 0.0143 0.0143 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
February EF (g/vmt) 0.0143 0.0143 0.0143 0.0143 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
March EF (g/vmt) 0.0143 0.0143 0.0143 0.0143 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
April EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
May EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
June EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
July EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
August EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
September EF (g/vmt) 0.0142 0.0142 0.0142 0.0142 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
October EF (g/vmt) 0.0141 0.0141 0.0141 0.0141 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
November EF (g/vmt) 0.0141 0.0141 0.0141 0.0141 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
December EF (g/vmt) 0.0141 0.0141 0.0141 0.0141 0.0000 0.0000
Daily VMT 0 751810 0 0 751810 0
Total Emissions (tpy) 0 4 0 0 0 4

STATUS

Inventory Calc: Pollutant: PM-2.5
Calendar: 11-2020
Month-by-Month
Tier 2.5 East
No LRF Program
No ATP
Seasonal Temp
Seasonal Rfcs
CHMT: 751810
Hourly TTI Speeds

U.S. Department of Transportation
Federal Highway Administration

STEP 6: View Results Table | EMIT - Easy Mobile Inventory Tool

File Edit View Help

Basic MB Fuel/State Monthly MB HPMS Calculate Results File Exit About

Run Description
Example PM-2.5 Emission Inventory

Emission Inventory Results

PM2.5 NOx HC NPD SO2

MOBILE6.2 Facility Type

Month Parameter Freeway Arterial Local Ramp Start/Day Total Emissions (tpy)

January EF (g/vmt) 0.633 0.461 0.475 0.515 0.007 0.007
Daily VMT 0 751810 0 0 751810 14
February EF (g/vmt) 0.622 0.452 0.466 0.504 0.005 0.005
Daily VMT 0 751810 0 0 751810 12
March EF (g/vmt) 0.603 0.433 0.449 0.483 0.000 0.000
Daily VMT 0 751810 0 0 751810 13
April EF (g/vmt) 0.571 0.411 0.426 0.458 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
May EF (g/vmt) 0.553 0.397 0.416 0.439 0.001 0.001
Daily VMT 0 751810 0 0 751810 12
June EF (g/vmt) 0.550 0.397 0.422 0.456 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
July EF (g/vmt) 0.551 0.398 0.427 0.457 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
August EF (g/vmt) 0.550 0.398 0.424 0.456 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
September EF (g/vmt) 0.553 0.398 0.420 0.440 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
October EF (g/vmt) 0.540 0.389 0.403 0.435 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
November EF (g/vmt) 0.539 0.407 0.419 0.435 0.000 0.000
Daily VMT 0 751810 0 0 751810 12
December EF (g/vmt) 0.540 0.425 0.437 0.459 0.000 0.000
Daily VMT 0 751810 0 0 751810 13
Total Emissions (tpy) 0 125 0 0 22 148

STATUS

Inventory Calc: Pollutant: PM-2.5
Calendar: 11-2020
Month-by-Month
Tier 2.5 East
No LRF Program
No ATP
Seasonal Temp
Seasonal Rfcs
CHMT: 751810
Hourly TTI Speeds

U.S. Department of Transportation
Federal Highway Administration

Summary Table of Results in EMIT

STEP 5: View Results Table | EMIT - Easy Mobile Inventory Tool

File Edit View Help

Basic ME Fuel/State Monthly ME Calculate Results File Exit About

Run Description
Seasonal MSATs

Emission Factor Results

ACET ACRO BENZ BUTA DPM FORM

Speed (mph)	Freeway	Arterial	Speed Emission Factor (mg/VMT)	Freeway	Arterial	Speed Emission Factor (mg/VMT)	Freeway	Arterial	Speed Emission Factor (mg/VMT)
5	460.523	463.874	25	39.323	39.821	46	34.368	34.368	
6	37.423	37.427	26	38.946	39.346	47	34.619	34.619	
7	75.627	77.505	27	38.588	38.803	48	33.877	33.877	
8	68.810	71.279	28	38.274	38.496	49	33.741	33.741	
9	63.510	66.427	29	37.873	38.115	50	33.610	33.610	
10	59.279	62.563	30	37.493	37.760	51	33.467	33.467	
11	55.720	58.183	31	37.297	37.550	52	33.330	33.330	
12	52.754	56.365	32	36.828	36.967	53	33.198	33.198	
13	50.243	53.882	33	36.561	36.686	54	33.070	33.070	
14	48.096	51.839	34	36.254	36.267	55	32.948	32.948	
15	46.230	50.188	35	35.947	35.947	56	32.833	32.833	
16	44.555	48.596	36	35.733	35.733	57	32.722	32.722	
17	43.112	47.039	37	35.574	35.574	58	32.618	32.618	
18	41.890	45.569	38	35.403	35.403	59	32.512	32.512	
19	40.859	44.183	39	35.240	35.240	60	32.413	32.413	
20	40.000	42.868	40	35.083	35.083	61	32.310	32.310	
21	39.226	41.617	41	34.918	34.918	62	32.211	32.211	
22			42	34.758	34.758	63	32.116	32.116	
23			43	34.606	34.606	64	32.022	32.022	
24			44	34.461	34.461	65	31.933	31.933	
25			45	34.322	34.322				

Local (12.9 mph) = 50.442
Ramp (34.6 mph) = 41.531

* Idle emission factors in units of g/vh-ft

STEP 5: View Results Table | EMIT - Easy Mobile Inventory Tool

File Edit View Help

Basic ME Fuel/State Monthly ME Calculate Results File Exit About

Run Description
Seasonal MSATs

Emission Factor Results

ACET ACRO BENZ BUTA DPM FORM

Speed (mph)	Freeway	Arterial	Speed Emission Factor (mg/VMT)	Freeway	Arterial	Speed Emission Factor (mg/VMT)	Freeway	Arterial	Speed Emission Factor (mg/VMT)
5	66.365	66.681	25	26.673	26.673	46	26.673	26.673	
6	26.673	26.673	26	26.673	26.673	47	26.673	26.673	
7	26.673	26.673	27	26.673	26.673	48	26.673	26.673	
8	26.673	26.673	28	26.673	26.673	49	26.673	26.673	
9	26.673	26.673	29	26.673	26.673	50	26.673	26.673	
10	26.673	26.673	30	26.673	26.673	51	26.673	26.673	
11	26.673	26.673	31	26.673	26.673	52	26.673	26.673	
12	26.673	26.673	32	26.673	26.673	53	26.673	26.673	
13	26.673	26.673	33	26.673	26.673	54	26.673	26.673	
14	26.673	26.673	34	26.673	26.673	55	26.673	26.673	
15	26.673	26.673	35	26.673	26.673	56	26.673	26.673	
16	26.673	26.673	36	26.673	26.673	57	26.673	26.673	
17	26.673	26.673	37	26.673	26.673	58	26.673	26.673	
18	26.673	26.673	38	26.673	26.673	59	26.673	26.673	
19	26.673	26.673	39	26.673	26.673	60	26.673	26.673	
20	26.673	26.673	40	26.673	26.673	61	26.673	26.673	
21	26.673	26.673	41	26.673	26.673	62	26.673	26.673	
22	26.673	26.673	42	26.673	26.673	63	26.673	26.673	
23	26.673	26.673	43	26.673	26.673	64	26.673	26.673	
24	26.673	26.673	44	26.673	26.673	65	26.673	26.673	
25	26.673	26.673	45	26.673	26.673				

Local (12.9 mph) = 26.673
Ramp (34.6 mph) = 26.673

* Idle emission factors in units of g/vh-ft

EMIT Setup

Log on to the FHWA ftp site

- ftp: //fhwaftp.fhwa.dot.gov/wrc/to
- User name: wrcquest
- Password: wrcquest

Log On As

Either the server does not allow anonymous logins or the e-mail address was not accepted.

FTP server: fhwaftp.fhwa.dot.gov

User name: wrcquest

Password:

After you log on, you can add this server to your Favorites and return to it easily.

FTP does not encrypt or encode passwords or data before sending them to the server. To protect the security of your passwords and data, use Web Folders (WebDAV) instead.

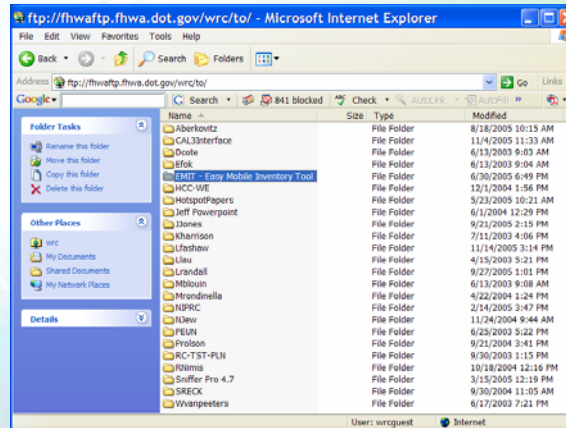
Learn more about [using Web Folders](#).

☐ Log on anonymously ☐ Save password

Log On Cancel

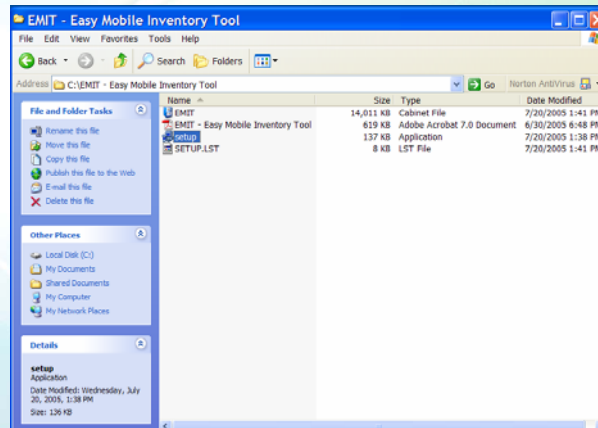
EMIT Setup (continued)

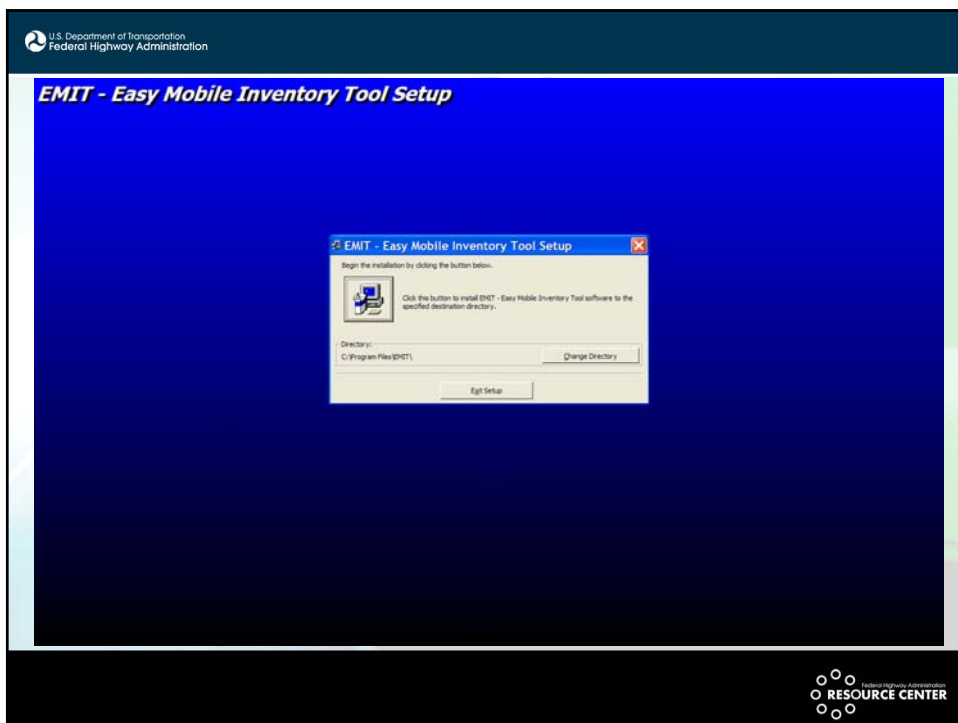
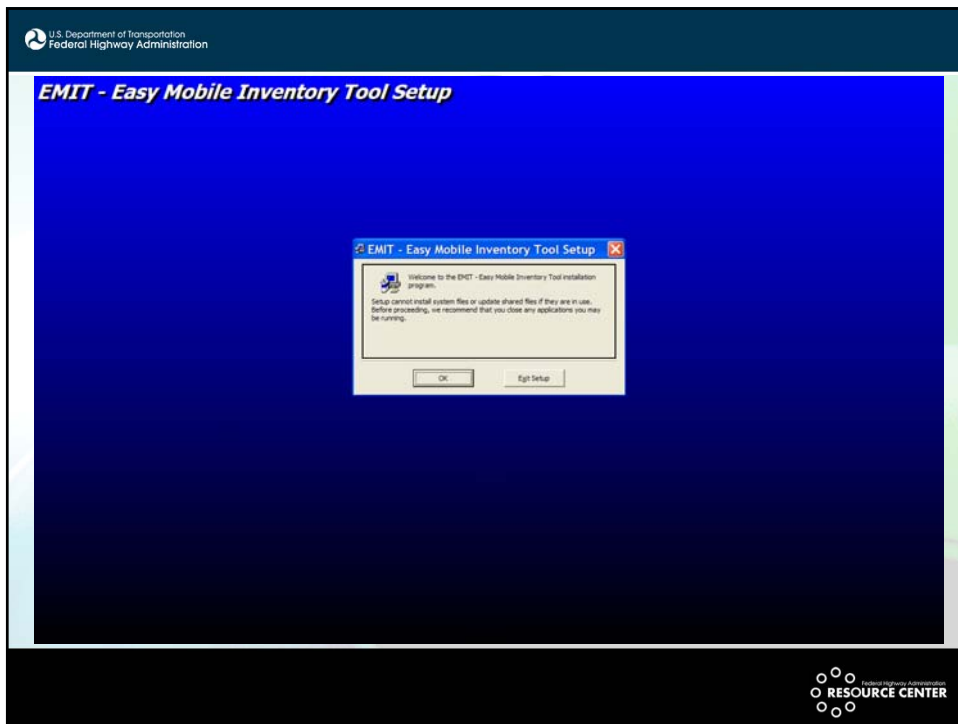
Copy the EMIT folder to your computer

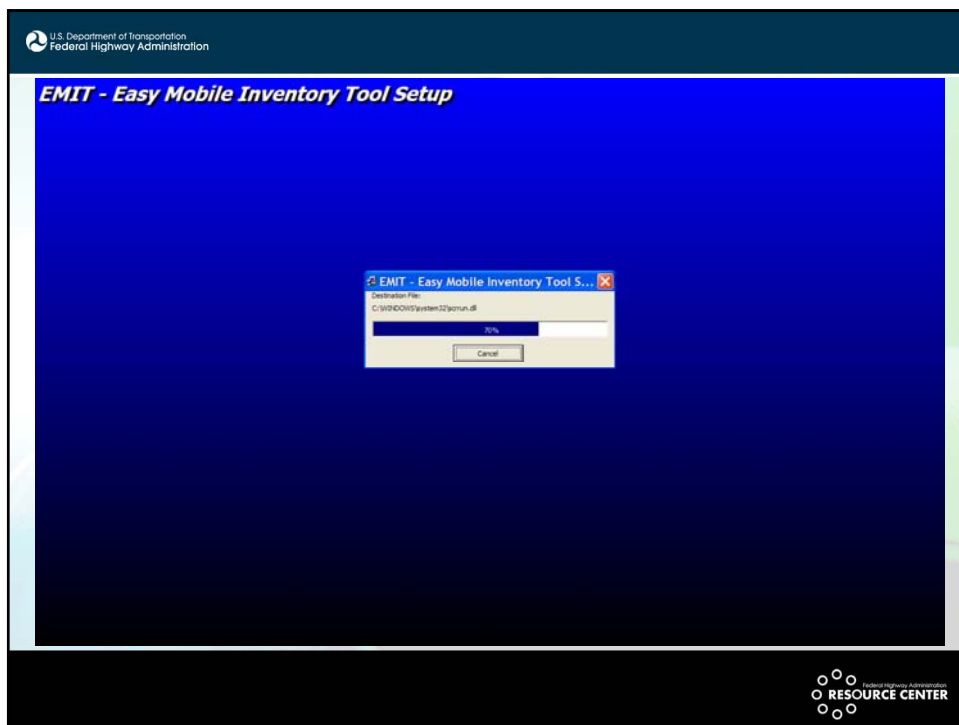
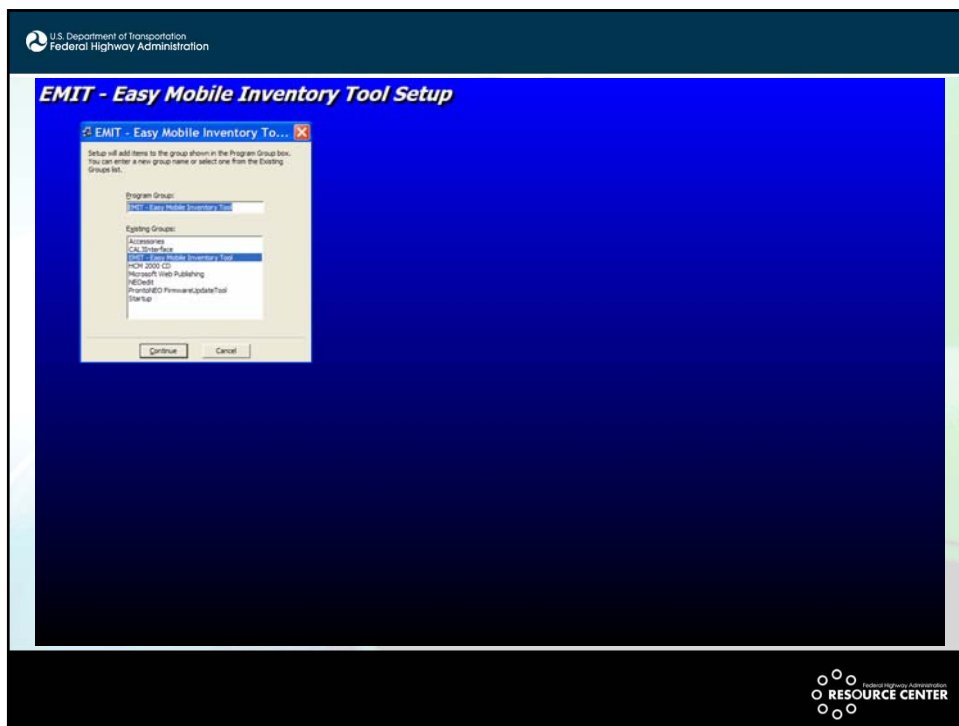


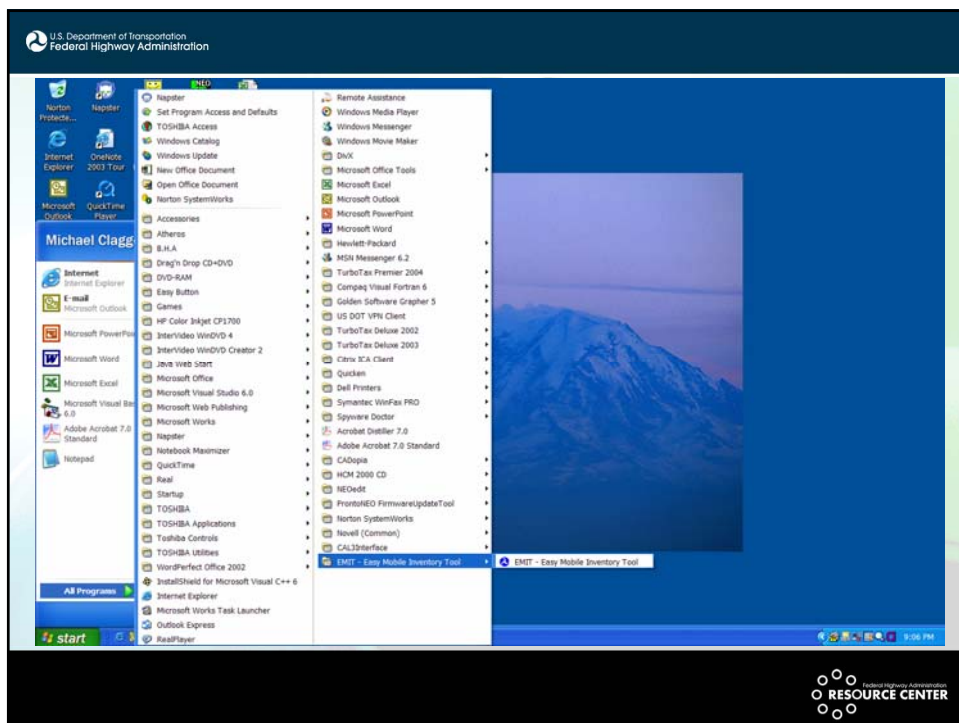
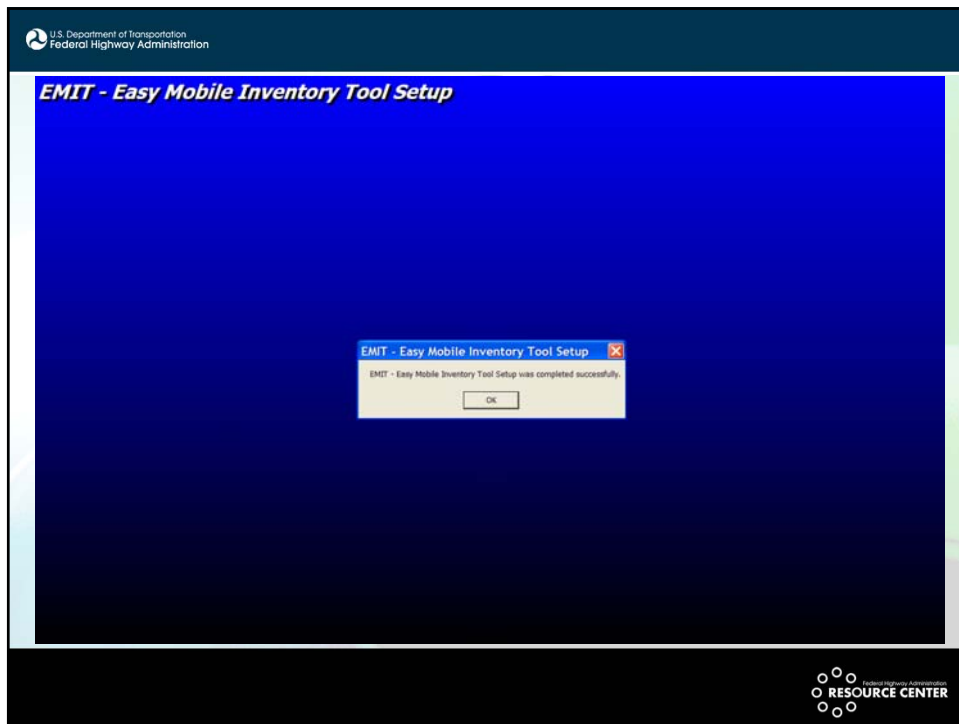
EMIT Setup (continued)

Execute setup and follow the prompts









EMIT Demonstration

Class Exercise

Class Exercise – Transportation Conformity Workshop
July 6 – 7, 2006

You are the air quality analyst for the State Highway Agency (SHA). The Mayor of Sunnyville – the largest city in the state – is seeking re-election and wants to strengthen his environmental platform. He has submitted to City Council a plan for a park and ride lot to be located off of Mineta Parkway, a major 6-lane east-west arterial which serves downtown Sunnyville. The rationale behind the plan is that the proposed transit facility will reduce automotive traffic and congestion on Mineta Parkway into the Central Business District and thus reduce overall air pollution. The project will be included as a Transportation Control Measure (TCM) in the next update to the Transportation Improvement Program (TIP). Sunnyville is designated a maintenance area for carbon monoxide (CO) and a non-attainment area for ozone (O₃). Plans are to construct a new 6-lane arterial crossing Mineta Parkway to provide access to the transit facility on the south side, as well as providing access to land on the north side of the parkway. A new, at-grade signalized intersection will be constructed as part of the project. The estimated time of completion for the project is 2010.

The park and ride lot is to be located in an area being developed as the city's primary medical complex. A number of hospitals, a medical research center, and an elderly care/children's care center are located near the proposed intersection. The park and ride lot would be located on a parcel owned by the brother-in-law of the City Council Chair. It has not been suitable for development as part of the medical complex because a small portion is a wetland. The topography of the Sunnyville area is characterized by gently rolling terrain.

Numerous neighborhood groups that oppose the plan have organized to form Citizen's Against Urban Sprawl (CAUSE). They would like to see the property developed as a nature preserve. They are also concerned about "all of those noisy, obnoxious, and smelly buses" that will be traveling in the vicinity of their neighborhoods. The Governor

– not of the same political party as the Mayor – has not publicly endorsed nor opposed the plan.

Your job is to objectively evaluate the impact that the proposed signalized intersection is expected to have on ambient CO concentrations and prepare a report for the Commissioner of the SHA, which will be shared with the Governor, the Mayor’s Office, the Commissioner of the State Air Pollution Control Agency, and CAUSE. The project has yet to be incorporated into the travel demand model for the urban transportation network, so the affected highway network with respect to vehicle-miles of traveled and vehicle emissions cannot be determined. A project-specific hourly VMT distribution has been developed (SunnyHr.def). Using the MOBILE6.2 model, predict the locale-specific CO emission factors and summarize the results in a speed look-up table. These results will be used to support a hotspot analysis for predicting ambient CO levels near the new intersection. An initial report is due by the end of the week.

The State Air Pollution Control Board has processed county vehicle registration data to generate a MOBILE6.2-compatible age distribution file (SunnyAge.d). The same information was used to obtain county-specific VMT fractions by vehicle type:

Vehicle Type	VMT Fraction
LDV	0.5067
LDT1	0.0770
LDT2	0.2562
LDT3	0.0790
LDT4	0.0363
HDV2B	0.0111
HDV3	0.0011
HDV4	0.0009
HDV5	0.0006
HDV6	0.0024
HDV7	0.0029
HDV8a	0.0032
HDV8b	0.0113
HDBS	0.0028
HDBT	0.0013
MC	0.0072

Sunnyville does not have a municipal airport, but its climatology is similar to St. Louis, MO. During January, the Sunnyville area uses the next to highest volatility fuel prescribed by the American Society of Testing Materials (ASTM) – class D, which has a Reid Vapor Pressure (RVP) of 13.5 psi.

There is an inspection/maintenance (I/M) program; an anti-tampering program (ATP); and a reformulated fuel program (RFG) implemented for the area. The State Air Pollution Control Board has supplied the appropriate I/M descriptor file (SunnyIM.d). The anti-tampering program (ATP) applies to all vehicles starting annual inspections in 1983. The first model year tested is 1981, while the last model year tested is 2050. The ATP compliance rate is 90%. The ATP provides inspections for all components, except the tailpipe lead deposit test. The RFG program is characterized by oxygenated fuels consisting almost exclusively of ethanol blends (i.e., 99.9%) with an oxygen content weight fraction of 0.035. Ether blends account for the remainder (i.e., 0.1%) with an oxygen content weight fraction of 0.027. No RVP waiver for splash blending of ethanol has been granted. The RVP of gasoline is limited to 13.5 psi during the winter. The Tier-2 sulfur phase-in schedule is conventional gasoline east.

For part 1 of the analysis, construct a speed look-up table of emission factors for all facility types. Consider all speeds in the range of 5 mph to 65 mph in 1 mph increments. Also include idle emission factors. Consider only the running (i.e., highway) components in the emission factor calculations. The resulting emission factors will be used in a follow-up analysis employing the CAL3QHC air dispersion model.

(NOTE: The MOBILE6.2 model provides a daily emission factor from a 24-hour profile of input data. For CAL3QHC modeling, we want CO emission factors for peak-hour traffic. We'll trick MOBILE6.2 in providing a peak 1-hour emission factor by using the normal daily minimum temperature measured in St. Louis during January as the minimum and maximum temperatures, i.e., no temperature variation over the day – just one set temperature representative of the morning peak hour.)



**High Altitude Designations
Minimum / Maximum Temperatures
Average Relative Humidity**

the manufacturer's test data will be accepted as the official data: *Provided*, That if the Administrator makes a determination, based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10675, Mar. 15, 1985, as amended at 54 FR 14488, Apr. 11, 1989; 58 FR 16020, Mar. 24, 1993]

§ 86.091-30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.091-7(d), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicles(s) (or engines(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.091-23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) ex-

cept in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled and methanol fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family evaporative emission family combination.

(A) *Light-duty vehicles.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate).

(B) *Light-duty trucks.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate), except for low-altitude standards and high altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high altitude.

(ii) For gasoline-fueled and methanol fueled heavy-duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.091-23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks, or diesel heavy-duty engines, included in the applicable particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.091-28(a)(6) and 86.091-28(b)(5)(i). New certificates issued under this paragraph will be applicable only for vehicles (or engines) produced subsequent to the date of issuance.

(iv) For light-duty trucks or heavy-duty engines included in the applicable NO_x averaging program, the manufacturer may at any time during production elect to change the level of any family NO_x emission limit by demonstrating compliance with the new limit as described in § 86.091-28(b)(5)(ii). New certificates issued under this paragraph will be applicable only for vehicles (or engines) produced subsequent to the day of issue.

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(1) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(2) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.087-8(i):

(1) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(2) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high-altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii) (A) or (B), and (a)(4)(ii)(C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales,

warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards at low-altitude, as provided in § 86.087-8(i), will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of the high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which

shall include, but not be limited to, either paragraph (a)(4)(iv) (A) or (B), and (a)(4)(iv)(C) of this section:

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a

designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a “designated high-altitude location” is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams	Cheyenne
Alamosa	Clear Creek
Arapahoe	Conejos
Archuleta	Costilla
Boulder	Crowley
Chaffee	Custer

Delta	Mesa
Denver	Mineral
Dolores	Moffat
Douglas	Montezuma
Eagle	Montrose
Elbert	Morgan
El Paso	Otero
Fremont	Ouray
Garfield	Park
Gilpin	Pitkin
Grand	Pueblo
Gunnison	Rio Blanco
Hinsdale	Rio Grande
Huerfano	Routt
Jackson	Saguache
Jefferson	San Juan
Kit Carson	San Miguel
Lake	Summit
La Plata	Teller
Larimer	Washington
Las Animas	Weld
Lincoln	

STATE OF NEVADA

Carson City	Lyon
Douglas	Mineral
Elko	Nye
Esmeralda	Pershing
Eureka	Storey
Humboldt	Washoe
Lander	White Pine
Lincoln	

STATE OF NEW MEXICO

Bernalillo	Otero
Catron	Rio Arriba
Colfax	Roosevelt
Curry	Sandoval
De Baca	San Juan
Grant	San Miguel
Guadalupe	Santa Fe
Harding	Sierra
Hidalgo	Socorro
Lincoln	Taos
Los Alamos	Torrance
Luna	Union
McKinley	Valencia
Mora	

STATE OF UTAH

Beaver	Morgan
Box Elder	Piute
Cache	Rich
Carbon	Salt Lake
Daggett	San Juan
Davis	Sanpete
Duchesne	Sevier
Emery	Summit
Garfield	Tooele
Grand	Uintah
Iron	Utah
Juab	Wasatch
Kane	Wayne
Millard	Weber

Environmental Protection Agency

§ 86.091-30

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

STATE OF ARIZONA	
Apache	Navajo
Cochise	Yavapai
Coconino	
STATE OF IDAHO	
Bannock	Franklin
Bear Lake	Fremont
Bingham	Jefferson
Blaine	Lemhi
Bonneville	Madison
Butte	Minidoka
Camas	Oneida
Caribou	Power
Cassia	Treton
Clark	Valley
Custer	
STATE OF MONTANA	
Beaverhead	Meagher
Deer Lodge	Park
Gallatin	Powell
Jefferson	Silver Bow
Judith Basin	Wheatland
Madison	
STATE OF NEBRASKA	
Banner	Kimball
Cheyenne	Sioux
STATE OF OREGON	
Harney	Lake
Klamath	
STATE OF TEXAS	
Jeff Davis	Parmer
Hudspeth	
STATE OF WYOMING	
Albany	Natrona
Campbell	Niobrara
Carbon	Park
Converse	Platte
Fremont	Sublette
Goshen	Sweetwater
Hot Springs	Teton
Johnson	Uinta
Laramie	Washakie
Lincoln	Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Can-

ada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government agency and approved by the Administrator.

(7) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.091-21(d).

(8) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082-2.

(9) For incomplete gasoline-fueled and methanol-fueled heavy-duty vehicles a certificate covers only those new motor vehicles which, when completed, conform to the nominal maximum fuel tank capacity limitations as described in the application for certification as required in § 86.091-21(e).

(10)(i) For diesel light-duty vehicle and diesel light-duty truck families which are included in a particulate averaging program, the manufacturer's production-weighted average of the particulate emission limits of all engine families in a participating class or classes shall not exceed the applicable diesel particulate standard, or the composite particulate standard defined in § 86.090-2 as appropriate, at the end of the model year, as determined in accordance with 40 CFR part 86. The certificate shall be void *ab initio* for those vehicles causing the production-weighted FEL to exceed the particulate standard.

(ii) For all heavy-duty diesel engines which are included in the particulate averaging, trading, or banking programs under § 86.091-15:

(A) All certificates issued are conditional upon the manufacturer complying with the provisions of § 86.091–15 and the averaging, trading, and banking related provision of other applicable sections, both during and after the model year production.

(B) Failure to comply with all provisions of § 86.091–15 will be considered to be a failure to satisfy the conditions upon which the certificate was issued, and the certificate may be deemed void *ab initio*.

(C) The manufacturer shall bear the burden of establishing to the satisfaction of the Administrator that the conditions upon which the certificate was issued were satisfied or excused.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family emission limits, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles*. (A) The durability data vehicle(s) selected under § 86.090–24(c)(1)(i) shall represent all vehicles of the same engine system combination.

(B) The emission data vehicle(s) selected under § 86.090–24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.090–24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks*. (A) The emission-data vehicle(s) selected under § 86.090–24(b)(1)(ii), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.090–24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission-data vehicle(s) selected under § 86.090–24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(D) The emission-data vehicle(s) selected under § 86.090–24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy-duty engines*. (A) An Otto-cycle emission-data test engine selected under § 86.090–24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) An Otto-cycle emission-data test engine selected under § 86.090–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission data test engine selected under § 86.090–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.090–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled and methanol-fueled heavy-duty vehicles*. A statement of compliance submitted under § 86.091–23(b)(4) (i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards (or family emission limits, as appropriate).

(3) If after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.090–29, data or information derived from any inspection carried out under § 86.091–7(d) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a

statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or family emission limits, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (*i.e.*, one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will

be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.090-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards (or family emission limits, as appropriate); or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or family emission limits, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards (or family emission limit, as appropriate):

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraphs (b)(4) or (b)(5) of this section (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.091-7(d) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.091-7(d) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i),(ii),(iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void *ab initio*.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.091-7(d) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (c)(1) (iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid *ab initio*.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.606 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access or to obtain "reasonable assistance" as authorized in § 86.606 of this part because a manufacturer has located its facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with §§ 86.604(a), 86.605, 86.607, 86.608, or 86.610.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1)(i), (ii), or (vii) of this section where the refusal is

caused by conditions and circumstances outside the control of the manufacturer which render it impossible to comply with those requirements.

(3) The sanction of suspending a certificate may be imposed for the reasons in paragraph (d)(1)(iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (d)(1)(v) of this section, the manufacturer shall have the burden of establishing the contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614; and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (d)(4) of this section will be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614.

(e) *For light-duty trucks and heavy-duty engines.* (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a

valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer

will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been

Environmental Protection Agency

§ 86.091–35

offered an opportunity for a hearing conducted in accordance with § 86.1014.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10682, Mar. 15, 1985, as amended at 54 FR 14493, Apr. 11, 1989; 55 FR 30625, July 26, 1990]

§ 86.091–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family emission limits, as appropriate) of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.091–30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable),

as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.087–8(h),

(1) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(2) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(3) A statement that the emission performance warranty provisions of 40 CFR part 85, subpart V do not apply when the vehicle is tested at high altitude; and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.087–8(i),

(1) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(2) A statement that the emission performance warranty provisions of 40 CFR part 85, subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BIRMINGHAM AP,AL	30	32.3	35.4	42.4	48.4	57.6	65.4	69.7	68.9	63.0	50.9	41.8	35.2	50.9
HUNTSVILLE, AL	30	30.7	34.0	41.2	48.4	57.5	65.4	69.5	68.1	61.7	49.6	40.7	33.8	50.1
MOBILE, AL	30	39.5	42.4	49.2	54.8	62.8	69.2	71.8	71.7	67.6	56.3	47.8	41.6	56.2
MONTGOMERY, AL	30	35.5	38.6	45.4	51.2	60.1	67.3	70.9	70.1	64.9	52.2	43.5	37.6	53.1
ANCHORAGE, AK	30	9.3	11.7	18.2	28.7	38.9	47.0	51.5	49.4	41.4	28.3	15.9	11.4	29.3
ANNETTE, AK	30	30.4	32.3	34.2	37.7	43.1	48.3	52.4	52.6	48.0	41.7	35.1	32.1	40.7
BARROW, AK	30	-19.6	-22.0	-20.0	-7.3	15.3	30.4	34.3	33.8	27.5	9.8	-6.4	-16.4	5.0
BETHEL, AK	30	0.7	1.3	7.2	18.4	33.1	43.3	48.8	47.5	39.1	24.7	11.7	3.2	23.3
BETTLES,AK	30	-19.2	-17.7	-8.0	10.6	33.7	46.9	49.5	43.7	32.8	11.9	-8.0	-15.1	13.4
BIG DELTA,AK	30	-9.6	-6.4	3.2	21.7	37.7	47.6	51.1	46.1	35.6	17.0	-0.8	-7.1	19.7
COLD BAY,AK	30	23.5	22.9	24.9	28.8	34.8	41.1	46.1	47.4	43.0	35.1	29.9	26.5	33.7
FAIRBANKS, AK	30	-19.0	-15.6	-2.7	19.8	36.9	48.5	51.9	46.2	34.7	15.6	-6.6	-15.2	16.3
GULKANA,AK	30	-12.9	-7.4	2.3	19.7	32.2	41.1	45.4	41.7	32.8	18.4	-2.2	-9.5	16.8
HOMER, AK	30	17.5	18.3	22.5	29.3	36.7	43.0	47.2	46.7	41.0	31.4	23.5	20.0	31.4
JUNEAU, AK	30	20.7	23.5	27.8	33.4	40.1	46.1	49.2	48.3	43.8	37.7	28.9	24.4	35.3
KING SALMON, AK	30	8.0	7.4	15.1	24.9	34.8	42.2	47.5	47.4	40.3	26.0	15.9	9.3	26.6
KODIAK, AK	30	24.6	24.3	26.8	31.8	38.2	43.9	48.5	48.6	43.2	34.3	28.9	25.3	34.9
KOTZEBUE, AK	30	-8.6	-9.9	-7.7	3.3	25.3	38.8	49.4	47.4	37.2	18.8	3.2	-6.4	15.9
MCGRATH, AK	30	-15.6	-12.5	-1.8	17.7	35.5	45.7	49.8	45.7	35.9	18.3	-2.2	-12.3	17.0
NOME, AK	30	-1.8	-2.3	1.0	12.4	31.1	40.6	46.6	45.2	37.2	22.9	10.8	0.9	20.4
ST. PAUL ISLAND, AK	30	21.5	18.9	19.5	24.0	31.5	37.6	43.0	45.1	40.7	34.1	29.1	24.7	30.8
TALKEETNA, AK	30	2.3	5.0	11.1	23.9	34.9	45.1	49.9	46.5	37.3	23.6	9.4	4.8	24.5
UNALAKLEET, AK	30	-3.9	-4.2	1.8	13.8	32.1	42.7	48.9	46.5	35.8	19.4	5.0	-1.4	19.7
VALDEZ, AK	30	17.2	19.6	23.8	30.9	38.6	45.0	48.0	46.4	40.9	33.4	23.9	20.2	32.3
YAKUTAT, AK	30	19.4	21.0	23.6	29.2	36.1	42.7	47.1	46.2	40.6	34.8	26.3	22.9	32.5
FLAGSTAFF, AZ	30	16.5	18.8	22.8	27.3	34.0	41.4	49.9	49.1	41.7	31.1	22.1	16.6	30.9
PHOENIX, AZ	30	43.4	47.0	51.1	57.5	66.3	75.2	81.4	80.4	74.5	62.9	50.0	43.5	61.1
TUCSON, AZ	30	38.9	41.6	45.1	50.5	58.6	68.0	73.4	72.4	67.7	57.0	45.1	39.2	54.8
WINSLOW, AZ	30	21.3	25.5	31.1	36.9	45.3	54.2	62.0	61.1	52.9	40.1	28.7	21.0	40.0
YUMA, AZ	30	46.2	48.8	52.8	58.1	65.1	73.2	80.8	80.8	75.3	64.0	52.2	45.8	61.9
FORT SMITH, AR	30	27.8	32.6	40.9	49.0	58.9	67.2	71.4	70.3	62.9	50.5	39.5	31.1	50.2
LITTLE ROCK, AR	30	30.8	34.8	42.6	50.0	59.2	67.8	72.0	70.5	63.6	51.5	41.5	33.9	51.5
NORTH LITTLE ROCK, AR	30	31.3	36.1	44.5	52.7	61.2	68.9	72.9	71.5	64.9	54.1	43.4	34.9	53.0
BAKERSFIELD, CA	30	39.3	43.0	46.2	49.6	56.8	63.7	69.2	68.4	63.9	54.9	44.2	38.2	53.1
BISHOP, CA	30	22.4	26.4	31.0	36.0	43.7	50.7	55.7	53.7	46.9	37.1	27.1	21.6	37.7
EUREKA, CA.	30	40.8	41.8	42.2	44.0	47.6	50.7	52.8	53.4	51.2	47.7	43.9	40.6	46.4
FRESNO, CA	30	38.4	41.4	44.9	48.4	54.9	61.2	66.1	64.9	60.4	51.9	42.3	37.0	51.0
LONG BEACH, CA	30	46.0	48.1	50.4	53.2	57.8	61.3	64.6	65.6	63.7	58.3	50.1	45.3	55.4
LOS ANGELES AP, CA	30	48.6	50.1	51.3	53.6	56.9	60.1	63.3	64.5	63.6	59.4	52.7	48.5	56.1

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
LOS ANGELES C.O., CA	30	48.5	50.3	51.6	54.4	57.9	61.4	64.6	65.6	64.6	59.9	52.6	48.3	56.6
MOUNT SHASTA, CA	30	26.4	28.7	30.3	33.3	39.0	44.9	48.9	47.5	42.9	36.6	29.9	25.8	36.2
REDDING, CA	30	35.5	38.1	41.1	44.9	51.6	59.6	64.1	60.8	56.5	48.0	39.8	35.0	47.9
SACRAMENTO, CA	30	38.8	41.9	44.2	46.3	50.9	55.5	58.3	58.1	55.8	50.6	42.8	37.7	48.4
SAN DIEGO, CA	30	49.7	51.5	53.6	56.4	59.8	62.6	65.9	67.4	66.1	61.2	53.6	48.9	58.1
SAN FRANCISCO AP, CA	30	42.9	45.5	46.8	48.1	50.5	52.9	54.5	55.5	55.1	52.4	47.5	43.0	49.6
SAN FRANCISCO C.O., CA	30	46.4	48.5	49.2	50.1	51.4	53.2	54.4	55.6	56.1	54.6	50.8	46.7	51.4
SANTA BARBARA, CA	30	40.8	44.0	46.0	47.6	50.5	53.9	57.3	58.4	56.6	51.6	44.0	39.9	49.2
SANTA MARIA, CA	30	39.3	41.4	42.7	43.4	46.9	50.4	53.5	54.2	52.9	48.2	41.8	38.2	46.1
STOCKTON, CA	30	38.1	41.0	43.6	46.7	52.1	57.5	60.8	60.3	57.4	50.5	42.1	36.7	48.9
ALAMOSA, CO	30	-3.7	4.7	15.8	22.8	32.4	40.4	46.4	45.2	36.5	23.9	11.1	-0.7	22.9
COLORADO SPRINGS, CO	30	14.5	18.0	23.9	31.4	40.7	49.5	54.8	53.6	45.4	34.3	22.6	15.6	33.7
DENVER, CO	30	15.2	19.1	25.4	34.2	43.8	53.0	58.7	57.4	47.3	35.9	23.5	16.4	35.8
GRAND JUNCTION, CO	30	15.6	22.7	31.0	37.5	46.4	55.3	61.4	59.7	50.4	38.6	26.3	17.5	38.5
PUEBLO, CO	30	14.0	18.8	26.3	34.5	44.8	53.5	59.4	58.1	48.7	35.3	22.5	15.1	35.9
BRIDGEPORT, CT	30	22.9	24.9	32.0	40.7	50.6	59.6	66.0	65.4	57.7	46.3	37.5	28.0	44.3
HARTFORD, CT	30	17.2	19.9	28.3	37.9	48.1	57.0	62.4	60.7	52.1	40.6	32.6	22.6	40.0
WILMINGTON, DE	30	23.7	25.8	33.4	42.1	52.4	61.8	67.3	65.8	58.1	45.6	36.9	28.4	45.1
WASHINGTON DULLES AP, D.C.	30	21.9	24.1	31.8	40.2	49.9	59.0	64.0	62.8	55.6	42.3	33.8	26.0	42.6
WASHINGTON NAT'L AP, D.C.	30	27.3	29.7	37.3	45.9	55.8	65.0	70.1	68.6	61.8	49.6	40.0	32.0	48.6
APALACHICOLA, FL	30	43.0	45.8	51.4	57.6	65.1	71.6	73.9	74.0	71.2	60.5	52.0	45.3	59.3
DAYTONA BEACH, FL	30	47.1	48.8	53.7	58.0	64.5	70.6	72.4	72.8	71.9	65.3	57.0	50.1	61.0
FORT MYERS, FL	30	54.5	55.4	59.3	62.7	68.4	73.1	74.2	74.4	73.9	68.6	62.1	56.2	65.2
GAINESVILLE, FL	30	42.4	44.7	49.9	54.7	62.0	68.4	70.8	70.6	68.1	59.2	51.1	44.4	57.2
JACKSONVILLE, FL	30	41.9	44.3	49.8	54.6	62.5	69.4	72.4	72.2	69.4	59.7	50.8	44.1	57.6
KEY WEST, FL	30	65.2	65.7	68.8	72.1	75.9	78.7	79.6	79.2	78.5	75.7	71.9	67.3	73.2
MIAMI, FL	30	59.6	60.5	64.0	67.6	72.0	75.2	76.5	76.5	75.7	72.2	67.5	62.2	69.1
ORLANDO, FL	30	49.9	51.3	55.9	59.9	65.9	71.3	72.6	73.0	71.9	65.5	58.7	52.6	62.4
PENSACOLA, FL	30	42.7	45.4	51.7	57.6	65.8	72.1	74.5	74.2	70.4	59.6	51.1	44.7	59.2
TALLAHASSEE, FL	30	39.7	42.1	48.2	52.8	62.3	69.8	72.7	72.7	69.2	56.9	47.9	41.6	56.3
TAMPA, FL	30	52.4	53.8	58.5	62.4	68.9	74.0	75.3	75.4	74.3	67.6	60.7	54.7	64.8
VERO BEACH, FL	30	52.7	53.6	57.8	61.6	67.2	71.8	73.0	72.9	72.7	68.5	61.9	54.7	64.0
WEST PALM BEACH, FL	30	57.3	58.2	61.9	65.4	70.5	73.8	75.0	75.4	74.7	71.2	65.8	60.1	67.4
ATHENS, GA	30	32.9	35.4	42.3	48.7	57.6	65.3	69.3	68.5	62.7	50.7	42.2	35.3	50.9
ATLANTA, GA	30	33.5	36.5	43.6	50.4	59.5	67.1	70.6	69.9	64.3	52.8	43.5	36.2	52.3
AUGUSTA,GA	30	33.1	35.5	42.5	48.1	57.2	65.4	69.6	68.4	62.4	49.6	40.9	34.7	50.6
COLUMBUS, GA	30	36.6	39.0	45.7	51.8	61.3	68.8	72.3	71.5	66.4	54.5	45.7	39.0	54.4
MACON, GA	30	34.5	37.0	43.8	49.5	58.6	66.6	70.5	69.5	63.7	51.1	42.5	36.3	52.0
SAVANNAH, GA	30	38.0	40.9	47.5	52.9	61.3	68.1	71.8	71.3	67.3	56.1	46.9	40.1	55.2
HILO, HI	30	63.6	63.5	64.7	65.6	66.7	68.0	69.2	69.4	69.0	68.5	67.2	64.9	66.7
HONOLULU,HI	30	65.7	65.4	66.9	68.2	69.6	72.1	73.8	74.7	74.2	73.2	71.1	67.8	70.2
KAHULUI, HI	30	63.3	63.1	64.6	66.0	67.0	69.3	70.8	71.0	70.0	69.4	67.9	65.1	67.3
LIHUE, HI	30	65.4	65.5	67.3	68.9	70.3	72.7	74.0	74.5	74.0	72.8	70.8	67.6	70.3

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BOISE, ID	30	23.6	28.8	34.0	39.4	46.6	54.2	60.3	59.8	51.2	41.3	32.4	24.1	41.3
LEWISTON, ID	30	28.0	31.2	35.6	40.6	47.0	53.6	59.3	59.3	50.9	41.2	34.1	28.5	42.5
POCATELLO, ID	30	16.3	20.9	27.3	32.6	39.2	45.7	50.9	49.9	41.8	33.3	24.9	16.8	33.3
CHICAGO, IL	30	14.3	19.2	28.5	37.6	47.5	57.2	63.2	62.2	53.7	42.1	31.6	20.4	39.8
MOLINE, IL	30	12.3	18.2	29.0	39.3	50.0	59.7	64.5	62.4	53.4	41.6	30.1	18.3	39.9
PEORIA, IL	30	14.3	19.7	30.2	40.3	50.8	60.1	64.6	62.6	54.0	42.3	31.4	20.1	40.9
ROCKFORD, IL	30	10.8	16.3	26.7	36.8	47.9	57.6	62.6	60.9	51.8	40.1	29.0	16.9	38.1
SPRINGFIELD, IL	30	17.1	22.2	32.4	42.2	52.7	61.9	66.0	63.9	55.4	44.4	33.7	22.6	42.9
EVANSVILLE, IN	30	22.6	26.2	35.2	43.8	54.0	63.5	67.8	65.1	57.0	44.6	36.0	27.0	45.2
FORT WAYNE, IN	30	16.1	19.2	28.8	38.2	49.1	58.8	62.5	60.4	52.8	41.8	32.7	22.3	40.2
INDIANAPOLIS, IN	30	18.5	22.5	32.0	41.2	51.8	61.3	65.2	63.3	55.2	43.6	34.1	24.0	42.7
SOUTH BEND, IN	30	15.7	19.0	28.2	37.7	48.4	58.3	62.8	61.3	53.3	42.3	32.6	21.7	40.1
DES MOINES, IA	30	11.7	17.8	28.7	39.9	51.4	61.0	66.1	63.9	54.3	42.2	29.0	16.7	40.2
DUBUQUE, IA	30	9.2	15.4	26.2	37.5	48.8	57.9	62.4	60.2	51.7	40.5	27.8	15.2	37.7
SIOUX CITY, IA	30	8.5	15.3	25.7	37.3	49.2	58.5	62.9	60.6	50.1	38.0	24.8	12.8	37.0
WATERLOO, IA	30	6.3	13.2	24.9	35.8	48.1	58.1	62.2	59.5	49.8	37.8	25.1	12.5	36.1
CONCORDIA, KS	30	16.9	21.9	31.1	41.2	51.9	61.8	67.4	65.6	56.1	44.0	30.5	20.8	42.4
DODGE CITY, KS	30	18.7	23.6	31.2	40.7	51.7	61.6	66.8	65.6	56.5	43.8	30.2	21.7	42.7
GOODLAND, KS	30	15.8	19.7	26.4	34.8	45.7	55.5	61.1	59.6	50.0	37.5	25.2	17.8	37.4
TOPEKA, KS	30	17.2	23.0	32.9	42.9	53.4	63.2	67.7	65.4	55.9	44.3	32.1	21.8	43.3
WICHITA, KS	30	20.3	25.3	34.4	43.7	54.0	63.9	69.1	67.9	59.3	46.9	33.9	24.0	45.2
GREATER CINCINNATI, OH	30	21.3	25.0	33.8	42.7	52.9	61.6	66.1	64.2	56.8	44.9	35.7	26.4	44.3
JACKSON, KY	30	25.7	28.9	37.4	45.8	54.3	61.9	65.7	64.3	58.4	47.4	38.9	30.2	46.6
LEXINGTON, KY	30	24.1	27.7	35.9	44.1	53.6	62.2	66.4	64.9	57.9	46.4	37.3	28.4	45.7
LOUISVILLE, KY	30	24.9	28.5	37.1	46.0	56.1	65.1	69.8	68.2	60.9	48.5	39.3	29.9	47.9
PADUCAH, KY	30	23.9	28.2	37.1	45.6	55.0	63.8	67.7	64.9	57.1	45.2	36.5	27.5	46.1
BATON ROUGE, LA	30	40.2	43.1	49.6	55.8	64.1	70.2	72.7	71.9	67.5	56.4	47.9	42.1	56.8
LAKE CHARLES, LA	30	41.2	44.3	50.8	57.2	65.7	72.1	74.3	73.6	69.1	58.6	49.7	43.3	58.3
NEW ORLEANS, LA	30	43.4	46.1	52.7	58.4	66.4	72.0	74.2	73.9	70.6	60.2	51.8	45.6	59.6
SHREVEPORT, LA	30	36.5	40.3	47.2	53.8	62.7	69.9	73.4	72.3	66.4	55.0	45.3	38.3	55.1
CARIBOU, ME	30	-0.3	2.9	15.2	29.2	40.7	49.9	54.8	52.6	43.6	34.1	23.7	8.0	29.6
PORTLAND, ME	30	12.5	15.6	25.2	34.7	44.2	52.9	58.6	57.2	48.5	37.4	29.5	18.7	36.3
BALTIMORE, MD	30	23.5	26.1	33.6	42.0	51.8	60.8	65.8	63.9	56.6	43.7	34.7	27.3	44.2
BLUE HILL, MA	30	18.1	20.3	27.8	37.1	47.0	55.9	62.0	60.9	53.2	42.9	34.2	23.8	40.3
BOSTON, MA	30	22.1	24.2	31.5	40.5	50.2	59.4	65.5	64.5	56.8	46.4	37.9	27.8	43.9
WORCESTER, MA	30	15.8	17.8	25.6	35.5	46.2	55.0	60.8	59.5	51.3	40.7	32.0	21.6	38.5
ALPENA, MI	30	9.5	9.7	18.7	30.2	40.0	48.8	54.5	52.9	45.2	35.6	27.0	16.9	32.4
DETROIT, MI	30	17.8	20.0	28.5	38.4	49.4	58.9	63.6	62.2	54.1	42.5	33.5	23.4	41.0
FLINT, MI	30	13.3	15.3	24.3	34.6	45.2	54.6	59.1	57.4	49.4	38.6	29.8	19.1	36.7
GRAND RAPIDS, MI	30	15.6	17.4	25.9	36.1	46.6	55.8	60.5	59.0	51.0	40.2	31.2	21.4	38.4
HOUGHTON LAKE, MI	30	9.7	10.5	19.2	30.6	40.7	48.9	53.4	52.2	45.3	36.2	27.6	16.8	32.6
LANSING, MI	30	13.9	15.4	24.3	34.5	44.8	54.3	58.4	57.0	48.9	38.6	30.1	19.7	36.7
MARQUETTE, MI	30	3.3	5.4	14.3	26.9	39.1	48.3	53.5	52.0	43.8	34.0	22.4	10.2	29.4

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
MUSKEGON, MI	30	17.1	18.3	25.4	35.1	45.1	54.2	59.8	58.8	50.7	40.6	31.8	22.6	38.3
SAULT STE. MARIE, MI	30	4.9	6.6	16.1	28.8	39.3	46.5	52.0	52.4	44.8	36.0	25.9	13.1	30.5
DULUTH, MN	30	-1.2	5.1	16.5	28.9	40.2	48.5	54.6	53.5	44.8	34.5	20.7	5.6	29.3
INTERNATIONAL FALLS, MN	30	-8.4	-0.7	12.3	27.1	40.0	49.1	53.6	51.3	41.6	31.5	16.4	-1.1	26.1
MINNEAPOLIS-ST.PAUL, MN	30	4.3	11.8	23.5	36.2	48.5	57.8	63.0	60.8	50.8	38.9	24.8	10.9	35.9
ROCHESTER, MN	30	3.7	10.6	22.6	34.6	46.1	55.6	60.1	58.0	48.7	37.1	23.7	10.1	34.3
SAINT CLOUD, MN	30	-1.2	6.4	19.1	32.2	44.1	52.9	57.9	55.5	45.7	34.3	20.4	5.5	31.1
JACKSON, MS	30	35.0	38.2	45.4	51.7	61.0	68.1	71.4	70.3	64.6	52.0	43.4	37.3	53.2
MERIDIAN, MS	30	34.7	37.7	44.3	50.4	59.5	66.8	70.5	69.8	64.2	51.3	42.8	37.2	52.4
TUPELO, MS	30	30.5	33.5	41.4	48.2	57.7	65.7	69.8	68.2	61.7	48.8	40.0	33.2	49.9
COLUMBIA, MO	30	18.2	23.4	33.0	42.9	52.8	61.8	66.3	64.0	55.4	44.1	33.0	22.5	43.1
KANSAS CITY, MO	30	17.8	23.3	33.2	43.5	53.9	63.2	68.2	66.1	57.2	45.9	33.4	22.5	44.0
ST. LOUIS, MO	30	21.2	26.5	36.2	46.5	56.6	65.9	70.6	68.6	60.3	48.2	36.7	25.8	46.9
SPRINGFIELD, MO	30	21.8	26.4	34.9	43.6	53.4	62.2	67.1	65.6	57.4	46.1	35.3	25.9	45.0
BILLINGS, MT	30	15.1	20.1	26.4	34.7	44.0	52.5	58.3	57.3	47.1	37.2	25.6	17.7	36.3
GLASGOW, MT	30	1.8	9.9	20.6	32.2	43.0	51.6	56.6	55.7	44.1	33.0	18.5	6.4	31.1
GREAT FALLS, MT	30	11.3	15.1	21.5	29.7	38.3	46.0	50.4	49.9	41.2	33.0	22.5	14.4	31.1
HAVRE, MT	30	3.7	10.4	20.0	30.0	40.2	48.0	52.0	51.3	40.7	29.8	17.3	7.8	29.3
HELENA, MT	30	9.9	15.6	23.5	31.2	39.8	47.5	52.3	50.8	41.2	31.2	20.3	11.3	31.2
KALISPELL, MT	30	13.8	18.4	24.8	30.8	37.9	43.5	46.7	45.8	37.1	28.4	23.2	16.1	30.5
MISSOULA, MT	30	16.2	20.5	27.1	32.4	39.3	45.9	50.2	49.3	40.6	31.4	24.0	16.5	32.8
GRAND ISLAND, NE	30	12.2	17.7	27.0	37.8	49.3	59.1	64.4	62.3	51.8	39.3	25.9	15.9	38.6
LINCOLN, NE	30	11.5	17.2	27.5	38.8	50.1	60.4	65.9	63.7	53.2	40.4	27.0	16.2	39.3
NORFOLK, NE	30	9.6	15.5	25.4	36.8	48.3	58.0	63.0	61.0	50.4	38.0	24.7	13.7	37.1
NORTH PLATTE, NE	30	9.9	15.4	23.8	33.4	44.5	54.2	60.2	58.4	46.7	33.7	20.7	12.1	34.4
OMAHA EPPLEY AP, NE	30	11.6	18.0	28.1	39.6	50.7	60.6	65.9	63.8	53.5	41.1	28.1	16.4	39.8
OMAHA (NORTH), NE	30	12.6	19.0	28.8	40.3	51.3	60.5	65.5	64.1	55.0	43.1	29.2	17.2	40.6
SCOTTSBLUFF, NE	30	11.0	15.8	23.0	31.4	42.4	52.1	57.4	54.9	43.7	31.3	19.7	11.6	32.9
VALENTINE, NE	30	7.8	13.7	22.1	32.4	43.7	53.2	59.1	57.3	45.8	33.1	20.1	10.5	33.2
ELKO, NV	30	14.1	19.7	25.9	29.9	36.8	43.5	48.6	47.0	38.1	28.3	20.9	13.8	30.6
ELY, NV	30	10.4	15.6	21.9	26.4	33.4	40.6	47.4	46.4	37.5	27.8	18.2	10.6	28.0
LAS VEGAS, NV	30	36.8	41.4	47.0	53.9	62.9	72.3	78.2	76.7	68.8	56.5	44.0	36.6	56.3
RENO, NV	30	21.8	25.4	29.3	33.2	40.2	46.5	51.4	49.9	43.1	34.0	26.4	20.7	35.2
WINNEMUCCA, NV	30	18.5	23.6	27.0	30.7	38.4	45.8	51.8	49.2	40.2	30.2	23.3	17.0	33.0
CONCORD, NH	30	9.7	12.6	22.7	32.2	42.4	51.8	57.1	55.6	46.6	35.1	27.6	16.2	34.1
MT. WASHINGTON, NH	30	-3.7	-1.7	5.9	16.4	29.5	38.5	43.3	42.1	34.6	24.0	13.6	1.7	20.4
ATLANTIC CITY AP, NJ	30	22.8	24.5	31.7	39.8	49.8	59.3	65.4	63.7	56.0	43.9	35.7	27.1	43.3
ATLANTIC CITY C.O.,NJ	30	29.0	30.6	37.0	45.2	54.8	63.9	69.8	69.7	63.6	52.5	42.9	34.0	49.4
NEWARK, NJ	30	24.4	26.6	34.2	43.7	54.1	63.5	69.1	67.7	59.9	48.2	39.1	29.8	46.7
ALBUQUERQUE, NM	30	23.8	28.2	33.7	40.5	49.7	59.4	64.7	63.2	56.0	43.8	31.6	24.2	43.2
CLAYTON, NM	30	20.3	23.7	29.2	37.2	46.7	55.9	60.2	59.2	51.5	40.6	28.7	21.6	39.6
ROSWELL, NM	30	24.4	29.3	35.7	43.3	53.2	62.0	66.7	65.5	58.3	46.3	33.3	25.1	45.3
ALBANY, NY	30	13.3	15.7	25.4	35.9	46.5	55.0	60.0	58.3	49.9	38.8	30.8	20.1	37.5

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BINGHAMTON, NY	30	15.0	16.7	24.7	35.1	46.2	54.4	59.2	57.4	49.9	39.6	30.9	20.8	37.5
BUFFALO, NY	30	17.8	18.6	26.1	36.4	47.7	56.9	62.1	60.5	52.9	42.6	33.7	23.6	39.9
ISLIP, NY	30	22.6	24.3	31.1	40.0	49.4	59.6	65.9	64.5	56.6	44.6	36.1	27.5	43.5
NEW YORK C.PARK, NY	30	26.2	28.1	35.1	44.2	54.2	63.3	68.8	67.7	60.3	49.6	41.0	31.6	47.5
NEW YORK (JFK AP), NY	30	24.7	26.1	32.9	41.6	51.2	60.4	66.7	66.3	59.5	48.7	39.8	30.5	45.7
NEW YORK (LAGUARDIA AP), NY	30	26.5	28.3	35.1	44.4	54.3	63.7	69.5	68.7	61.6	50.9	41.6	32.0	48.1
ROCHESTER, NY	30	16.6	17.3	25.2	35.3	46.1	55.0	60.0	58.7	51.3	41.1	32.6	22.7	38.5
SYRACUSE, NY	30	14.0	15.5	24.2	34.9	45.8	54.6	60.1	58.8	51.1	40.4	32.0	20.9	37.7
ASHEVILLE, NC	30	25.8	28.0	34.9	41.8	50.6	58.3	62.7	61.8	55.4	43.3	35.3	28.8	43.9
CAPE HATTERAS, NC	30	38.6	39.0	44.5	51.8	60.2	68.1	72.9	72.3	68.5	58.8	50.3	42.6	55.6
CHARLOTTE, NC	30	32.1	34.4	41.6	49.1	58.2	66.5	70.6	69.3	63.0	50.9	41.8	34.9	51.0
GREENSBORO-WNSTN-SALM-HGHPT,NC	30	28.2	30.6	37.8	45.5	54.7	63.5	68.1	66.8	60.1	47.5	38.6	31.4	47.7
RALEIGH, NC	30	29.6	31.9	38.9	46.4	55.3	63.8	68.5	67.2	61.0	48.2	39.5	32.6	48.6
WILMINGTON, NC	30	35.8	37.5	43.7	51.2	59.8	67.6	72.3	71.0	65.9	53.9	45.1	38.1	53.5
BISMARCK, ND	30	-0.6	7.8	19.1	30.6	42.8	51.6	56.4	54.7	43.7	32.1	17.8	4.8	30.1
FARGO, ND	30	-2.3	5.4	19.0	32.4	45.3	54.5	59.0	57.0	46.1	34.4	18.7	4.2	31.1
GRAND FORKS, ND	30	-4.3	3.7	17.1	31.0	43.5	52.8	56.8	54.5	44.3	33.0	17.4	2.5	29.4
WILLISTON, ND	30	-3.3	5.9	17.2	29.1	40.9	50.1	55.2	53.8	42.2	30.2	14.9	2.1	28.2
AKRON, OH	30	17.4	19.8	27.9	37.1	47.8	56.8	61.3	60.2	53.1	42.1	33.4	23.6	40.0
CLEVELAND, OH	30	18.8	21.0	28.9	37.9	48.3	57.7	62.3	61.2	54.3	43.7	34.9	24.9	41.2
COLUMBUS, OH	30	20.3	23.5	32.2	41.2	51.8	60.7	64.9	63.2	55.9	44.0	34.9	25.9	43.2
DAYTON, OH	30	19.0	22.4	31.2	40.4	51.1	60.2	64.4	62.2	54.6	43.5	34.3	24.4	42.3
MANSFIELD, OH	30	16.2	18.7	26.8	36.1	46.7	55.8	60.3	58.9	52.1	41.3	32.2	22.0	38.9
TOLEDO, OH	30	16.4	18.9	27.9	37.7	48.6	58.2	62.6	60.7	52.9	41.6	32.6	22.3	40.0
YOUNGSTOWN, OH	30	17.4	19.3	27.1	36.5	46.2	54.6	58.7	57.5	50.9	40.9	33.0	23.4	38.8
OKLAHOMA CITY, OK	30	26.2	31.1	39.4	48.1	57.9	66.4	70.8	69.8	62.2	50.6	38.2	29.2	49.2
TULSA, OK	30	26.3	31.1	40.3	49.5	59.0	67.9	73.1	71.2	62.9	51.1	39.3	29.8	50.1
ASTORIA, OR	30	36.7	37.6	38.6	40.8	45.4	49.8	52.9	53.2	49.5	44.1	40.1	37.1	43.8
BURNS,OR	30	14.0	19.4	24.9	28.6	35.6	41.1	46.4	43.9	35.0	26.4	20.6	14.6	29.2
EUGENE, OR	30	33.0	34.9	36.7	38.9	42.7	47.0	50.8	50.8	46.7	40.5	37.2	33.3	41.0
MEDFORD, OR	30	30.9	33.1	35.9	39.0	44.0	50.1	55.2	54.9	48.3	40.2	35.0	31.0	41.5
PENDLETON, OR	30	27.4	30.9	35.4	39.7	45.9	52.0	57.5	57.3	49.7	40.7	33.8	27.7	41.5
PORTLAND, OR	30	34.2	35.9	38.6	41.9	47.5	52.6	56.9	57.3	52.5	45.2	39.8	35.0	44.8
SALEM, OR	30	33.5	34.7	36.6	38.8	43.6	48.4	52.0	52.1	47.7	41.3	37.9	33.9	41.7
SEXTON SUMMIT, OR	30	32.5	33.0	32.5	34.9	39.6	45.4	51.8	52.7	49.8	43.3	35.2	32.5	40.3
GUAM, PC	30	71.2	71.1	71.7	72.7	73.2	73.5	72.8	72.8	72.8	72.7	73.6	73.1	72.6
JOHNSTON ISLAND, PC	30	73.1	73.2	73.4	74.2	75.2	76.6	77.4	78.0	77.9	77.5	75.7	73.9	75.5
KOROR, PC	30	75.1	74.9	75.2	75.8	76.0	75.4	75.3	75.7	76.0	75.8	75.9	75.6	75.6
KWAJALEIN, MARSHALL IS., PC	30	77.5	77.5	77.9	77.8	78.0	77.8	77.6	77.6	77.5	77.8	77.7	77.9	77.7
MAJURO, MARSHALL IS, PC	30	76.3	76.6	76.5	76.4	76.5	76.3	76.2	76.3	76.4	76.3	76.4	76.3	76.4
PAGO PAGO, AMER SAMOA, PC	30	76.1	76.3	76.6	76.3	76.2	76.1	75.5	75.5	75.8	76.2	76.5	76.4	76.1
POHNPEI, CAROLINE IS., PC	30	74.8	75.1	75.2	74.7	74.6	74.2	73.2	72.8	72.6	72.6	73.3	74.5	74.0
CHUUK, E. CAROLINE IS., PC	30	75.9	76.2	76.4	76.4	76.1	76.0	75.0	74.3	74.7	74.5	75.8	75.3	75.6

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
WAKE ISLAND, PC	30	73.1	72.4	73.1	73.9	75.3	77.1	77.8	77.9	78.4	77.4	76.3	74.7	75.6
YAP, W CAROLINE IS., PC	30	73.7	73.8	74.0	74.6	74.9	74.3	74.0	73.7	73.7	73.8	74.0	74.2	74.1
ALLENTOWN, PA	30	19.1	21.0	28.9	37.8	48.3	57.7	62.6	60.7	52.7	41.1	32.7	24.0	40.6
ERIE, PA.	30	20.3	20.9	28.2	37.9	48.7	58.5	63.7	62.7	55.9	45.5	36.4	26.8	42.1
HARRISBURG, PA	30	23.1	24.7	32.5	41.5	51.4	60.6	66.0	64.2	56.7	44.6	36.1	27.8	44.1
MIDDLETOWN/HARRISBURG INTL APT	30	23.1	24.7	32.5	41.5	51.4	60.6	66.0	64.2	56.7	44.6	36.1	27.8	44.1
PHILADELPHIA, PA	30	25.5	27.5	35.1	44.2	54.8	64.0	69.7	68.5	60.9	48.7	39.5	30.6	47.4
PITTSBURGH, PA	30	19.9	22.3	30.1	39.1	49.2	57.7	62.4	61.0	53.9	42.5	34.2	25.3	41.5
AVOCA, PA	30	18.5	20.4	28.4	38.1	48.4	56.7	61.5	60.1	52.6	41.7	33.7	24.2	40.4
WILLIAMSPORT, PA	30	17.9	19.9	28.2	37.8	47.8	56.8	61.7	60.4	52.8	40.9	32.7	23.7	40.1
PROVIDENCE, RI	30	20.3	22.5	30.0	39.1	48.8	57.9	64.1	62.8	54.5	43.1	35.1	25.6	42.0
CHARLESTON AP,SC	30	36.9	39.1	46.0	52.2	61.3	68.5	72.5	71.6	67.1	55.3	46.4	39.3	54.7
CHARLESTON C.O.,SC	30	42.4	44.9	51.5	58.8	67.4	73.8	77.0	76.1	72.2	61.9	53.4	45.5	60.4
COLUMBIA, SC	30	34.0	36.3	43.5	50.7	60.0	67.9	71.8	70.6	64.6	51.5	42.6	36.1	52.5
GREENVILLE-SPARTANBURG AP, SC	30	31.4	33.9	40.5	47.0	56.2	64.3	68.7	67.9	61.7	49.7	41.0	34.3	49.7
ABERDEEN, SD	30	0.6	8.8	21.2	33.4	45.6	54.8	59.7	57.4	46.5	34.4	19.7	6.3	32.4
HURON, SD	30	3.5	10.8	22.3	33.9	45.8	55.4	60.7	58.6	47.3	34.9	21.1	8.4	33.6
RAPID CITY, SD	30	11.3	15.9	23.2	32.3	42.7	51.8	57.9	56.6	46.0	34.7	22.1	13.3	34.0
SIOUX FALLS, SD	30	2.9	10.1	21.3	32.5	44.6	54.5	60.3	58.4	47.6	34.8	20.7	7.8	33.0
BRISTOL-JHNSN CTY-KNGSPRT,TN	30	24.3	27.0	34.6	42.0	51.0	59.5	63.5	61.7	54.7	41.8	33.6	26.8	43.4
CHATTANOOGA, TN	30	29.9	32.6	40.0	47.0	56.2	64.6	69.4	68.3	61.7	48.5	39.5	32.7	49.2
KNOXVILLE, TN	30	28.9	31.8	39.1	46.6	55.6	63.9	68.5	67.3	60.8	47.7	38.9	31.9	48.4
MEMPHIS, TN	30	31.3	35.5	43.7	51.9	60.8	68.8	72.9	71.2	64.3	52.5	42.6	34.5	52.5
NASHVILLE, TN	30	27.9	31.2	39.4	47.1	56.7	65.0	69.5	68.0	61.0	48.6	39.5	31.5	48.8
OAK RIDGE,TN	30	27.2	29.5	36.6	43.8	53.4	61.7	66.4	65.2	58.8	45.7	36.4	29.8	46.2
ABILENE, TX	30	31.8	36.5	43.8	51.8	61.0	68.5	72.3	71.4	64.4	54.4	42.3	33.9	52.7
AMARILLO, TX	30	22.6	27.0	33.6	41.7	51.7	61.1	65.3	63.8	56.3	44.6	31.8	24.1	43.6
AUSTIN/CITY, TX	30	40.0	44.0	50.9	57.6	65.4	71.1	73.4	73.3	68.8	59.8	49.3	41.9	58.0
AUSTIN/BERGSTROM, TX	30	37.3	41.0	48.4	56.3	65.1	70.2	71.5	70.3	65.3	56.3	45.9	38.2	55.5
BROWNSVILLE, TX	30	50.5	53.3	59.5	65.2	71.6	74.9	75.4	75.3	72.6	65.9	58.6	52.0	64.6
CORPUS CHRISTI, TX	30	46.2	49.3	56.2	62.3	69.5	73.5	74.4	74.5	71.6	64.0	55.4	48.1	62.1
DALLAS-FORT WORTH, TX	30	34.0	38.7	46.4	54.0	63.0	70.7	74.6	74.0	67.2	56.4	45.1	36.8	55.1
DALLAS-LOVE FIELD, TX	30	36.4	41.0	48.5	56.1	64.9	72.7	76.8	76.4	69.2	58.2	46.8	38.6	57.1
DEL RIO, TX	30	39.7	44.1	51.6	58.5	66.7	72.1	74.3	74.1	69.4	60.5	49.2	41.2	58.5
EL PASO, TX	30	32.9	37.5	43.7	51.1	60.6	68.8	72.0	70.2	63.7	51.8	39.8	33.4	52.1
GALVESTON, TX	30	49.7	51.5	58.2	64.7	72.3	77.8	79.8	79.5	75.6	68.4	59.4	51.8	65.7
HOUSTON, TX	30	41.2	44.3	51.3	57.9	66.1	71.8	73.5	73.0	68.4	58.8	49.8	42.8	58.2
LUBBOCK, TX	30	24.4	28.9	36.2	45.4	55.6	64.1	67.7	66.0	58.4	47.0	34.5	26.1	46.2
MIDLAND-ODESSA, TX	30	29.6	34.1	40.8	48.6	58.8	66.4	69.1	67.9	61.6	51.3	38.8	31.2	49.9
PORT ARTHUR, TX	30	42.9	45.9	52.4	58.6	66.4	72.3	73.8	73.2	69.4	59.6	50.8	44.5	59.2
SAN ANGELO, TX	30	31.8	36.0	43.3	51.0	60.6	67.6	70.4	69.4	63.0	53.0	41.4	33.5	51.8
SAN ANTONIO, TX	30	38.6	42.4	49.9	56.9	65.5	71.6	74.0	73.6	68.8	59.4	48.6	40.8	57.5
VICTORIA, TX	30	43.6	46.7	53.9	60.1	68.1	73.3	75.0	74.6	70.3	61.6	52.3	45.2	60.4

Normal Daily Minimum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
WACO, TX	30	35.1	39.3	46.8	54.2	63.3	70.6	74.1	73.5	67.0	56.7	45.8	37.5	55.3
WICHITA FALLS, TX	30	28.9	33.4	41.1	49.3	59.3	67.8	72.4	71.3	63.7	52.4	40.1	31.3	50.9
MILFORD, UT	30	15.5	20.2	26.4	31.6	38.9	47.1	55.4	54.5	44.9	33.1	23.0	15.0	33.8
SALT LAKE CITY, UT	30	21.3	25.5	33.4	39.0	46.9	55.8	63.4	62.4	52.4	41.0	30.4	22.4	41.2
BURLINGTON, VT	30	9.3	10.9	21.8	33.6	45.2	54.7	59.8	58.1	49.9	38.9	30.3	17.3	35.8
LYNCHBURG, VA	30	24.5	26.9	34.4	42.6	51.2	59.5	63.7	62.4	55.9	43.7	35.2	27.9	44.0
NORFOLK, VA	30	32.3	33.6	40.1	47.8	57.6	66.2	71.4	70.1	64.8	52.8	43.7	36.1	51.4
RICHMOND, VA	30	27.6	29.7	37.0	45.3	54.6	63.3	68.3	66.8	59.9	47.2	38.4	31.1	47.4
ROANOKE, VA	30	26.6	29.0	36.5	44.2	52.3	60.4	64.9	63.4	56.6	44.6	36.6	29.6	45.4
OLYMPIA, WA	30	31.8	32.6	34.1	36.5	42.0	46.4	49.6	49.5	44.9	38.9	35.3	32.1	39.5
QUILLAYUTE, WA	30	34.6	35.1	35.7	37.6	41.9	46.0	49.0	49.2	45.7	40.9	37.5	34.6	40.7
SEATTLE C.O., WA	30	36.0	37.1	39.2	42.5	48.2	52.7	56.4	57.1	52.6	46.4	40.4	36.1	45.4
SEATTLE SEA-TAC AP, WA	30	35.9	37.2	39.1	42.1	47.2	51.7	55.3	55.7	51.9	45.7	39.9	35.9	44.8
SPOKANE, WA	30	21.7	25.7	30.4	35.5	42.6	49.2	54.6	54.5	45.9	35.8	28.7	21.6	37.2
WALLA WALLA WASHINGTON	30	28.8	32.5	36.9	41.3	47.6	54.3	60.7	61.2	52.9	43.6	36.0	29.3	43.8
YAKIMA, WA	30	20.5	24.7	28.9	33.2	40.0	46.2	50.9	50.1	42.3	32.9	26.3	20.5	34.7
SAN JUAN, PR	30	70.8	70.9	71.7	73.2	74.9	76.6	76.9	77.0	76.5	75.6	74.0	72.1	74.2
BECKLEY, WV	30	22.1	24.9	32.4	40.6	49.2	57.0	61.1	59.8	53.5	42.4	34.4	26.5	42.0
CHARLESTON, WV	30	24.2	26.7	34.0	41.8	50.3	58.3	62.9	61.7	55.0	43.1	35.3	28.2	43.5
ELKINS, WV	30	18.0	19.7	26.9	34.6	44.1	52.7	57.6	56.7	50.1	37.0	29.3	21.9	37.4
HUNTINGTON, WV	30	24.5	27.5	35.5	43.7	52.6	60.9	65.4	64.1	56.8	44.8	36.6	28.9	45.1
GREEN BAY, WI	30	7.1	12.1	22.6	33.9	44.7	54.0	58.6	56.5	47.5	36.9	25.6	13.3	34.4
LA CROSSE, WI	30	6.3	12.8	24.5	37.1	48.7	57.9	62.8	60.7	51.7	40.1	27.4	13.6	37.0
MADISON, WI	30	9.3	14.3	24.6	35.2	46.0	55.7	61.0	58.7	49.9	38.9	27.7	15.8	36.4
MILWAUKEE, WI	30	13.4	18.3	27.3	36.4	46.2	56.3	62.9	62.1	54.1	42.6	31.0	19.4	39.2
CASPER, WY	30	12.2	16.4	23.1	29.3	37.9	46.6	53.2	51.8	41.7	31.8	21.3	14.0	31.6
CHEYENNE, WY	30	14.8	17.2	22.0	28.7	38.3	47.5	53.4	52.0	42.9	32.5	22.1	16.1	32.3
LANDER, WY	30	8.7	13.9	23.5	31.3	40.3	48.9	55.4	54.1	44.4	33.2	18.9	9.9	31.9
SHERIDAN, WY	30	9.7	14.9	22.5	30.4	38.6	46.8	52.4	51.5	41.0	30.3	18.5	10.4	30.6

 [Top of Page](#)

 [NCDC](#) / [Get/View Data](#) / [Comparative Climatic Data](#) / [Search](#)

<http://www.ncdc.noaa.gov/oa/climate/online/ccd/mintemp.html>

Downloaded Thursday, 06-May-2004 17:36:28 EDT

Last Updated Monday, 21-Apr-2003 09:10:45 EDT by Dan.Dellinger@noaa.gov

Please see the [NCDC Contact Page](#) if you have questions or comments.

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BIRMINGHAM AP,AL	30	52.8	58.3	66.5	74.1	81.0	87.5	90.6	90.2	84.6	74.9	64.5	56.0	73.4
HUNTSVILLE, AL	30	48.9	54.6	63.4	72.3	79.6	86.5	89.4	89.0	83.0	72.9	61.6	52.4	71.1
MOBILE, AL	30	60.7	64.5	71.2	77.4	84.2	89.4	91.2	90.8	86.8	79.2	70.1	62.9	77.4
MONTGOMERY, AL	30	57.6	62.4	70.5	77.5	84.6	90.6	92.7	92.2	87.7	78.7	68.7	60.3	77.0
ANCHORAGE, AK	30	22.2	25.8	33.6	43.9	54.9	62.3	65.3	63.3	55.0	40.0	27.7	23.7	43.1
ANNETTE, AK	30	39.7	41.9	44.7	49.8	55.7	60.3	64.1	64.6	59.6	51.4	44.2	40.7	51.4
BARROW, AK	30	-7.7	-9.8	-7.4	6.3	24.9	39.5	46.5	43.6	34.8	19.3	4.6	-4.7	15.8
BETHEL, AK	30	12.4	13.9	21.8	33.3	49.4	59.4	63.1	59.7	51.7	35.3	23.1	15.6	36.6
BETTLES,AK	30	-3.1	2.0	16.4	34.1	54.9	68.7	70.8	63.2	49.1	25.4	6.4	0.4	32.4
BIG DELTA,AK	30	4.4	10.9	25.1	42.5	57.8	67.3	70.4	64.8	53.2	31.1	13.5	7.2	37.4
COLD BAY,AK	30	32.8	32.3	35.1	38.2	44.9	50.8	55.1	56.2	52.5	45.0	39.1	35.5	43.1
FAIRBANKS, AK	30	-0.3	8.0	25.0	43.6	60.6	70.9	73.0	66.3	54.3	31.4	11.2	3.3	37.3
GULKANA,AK	30	3.5	13.8	28.2	42.4	55.6	65.0	68.5	64.5	53.4	34.3	13.2	6.4	37.4
HOMER, AK	30	29.3	31.4	36.3	43.4	50.6	57.0	61.0	60.8	54.8	44.1	35.2	31.6	44.6
JUNEAU, AK	30	30.6	34.3	39.5	48.1	55.7	61.6	64.3	63.1	56.1	46.9	37.6	33.0	47.6
KING SALMON, AK	30	22.8	23.8	32.0	41.3	52.1	59.5	63.8	62.2	54.9	40.5	30.5	25.1	42.4
KODIAK, AK	30	34.7	35.5	38.3	42.7	48.8	54.5	59.6	61.4	55.6	46.2	39.0	35.8	46.0
KOTZEBUE, AK	30	3.7	3.0	7.2	19.6	37.8	50.8	60.0	56.7	46.4	27.5	13.3	6.0	27.7
MCGRATH, AK	30	2.3	10.7	25.3	40.5	56.8	67.6	69.7	64.1	53.4	32.2	13.8	4.8	36.8
NOME, AK	30	13.4	13.6	17.7	26.8	43.0	53.9	58.6	56.0	48.6	34.0	23.0	15.8	33.7
ST. PAUL ISLAND, AK	30	29.8	27.6	28.8	32.8	39.8	46.2	50.3	51.6	49.2	42.5	37.1	32.9	39.1
TALKEETNA, AK	30	19.6	25.7	34.0	44.6	56.7	65.4	67.9	64.6	55.1	39.1	25.6	21.2	43.3
UNALAKLEET, AK	30	10.5	12.7	19.6	31.5	46.9	55.2	62.0	59.6	51.3	33.6	20.2	13.6	34.7
VALDEZ, AK	30	26.6	30.0	35.8	44.4	52.9	59.4	62.3	60.8	53.3	43.0	32.7	29.1	44.2
YAKUTAT, AK	30	32.1	35.7	39.3	45.1	51.1	56.6	60.1	60.4	55.7	47.3	38.4	34.3	46.3
FLAGSTAFF, AZ	30	42.9	45.6	50.3	58.4	67.6	78.7	82.2	79.7	73.8	63.1	50.8	43.7	61.4
PHOENIX, AZ	30	65.0	69.4	74.3	83.0	91.9	102.0	104.2	102.4	97.4	86.4	73.3	65.0	84.5
TUCSON, AZ	30	64.5	68.4	73.3	81.5	90.4	100.2	99.6	97.4	94.0	84.0	72.3	64.6	82.5
WINSLOW, AZ	30	47.1	54.4	61.5	69.8	79.0	90.0	93.0	90.1	83.5	71.7	57.7	47.1	70.4
YUMA, AZ	30	69.9	75.2	80.1	87.2	94.7	104.4	107.3	106.1	101.0	90.3	77.3	69.0	88.5
FORT SMITH, AR	30	48.1	54.8	64.2	73.2	80.0	87.7	92.9	92.6	84.9	75.0	61.4	50.9	72.1
LITTLE ROCK, AR	30	49.5	55.6	64.2	72.9	81.0	89.0	92.8	92.1	85.1	75.1	62.0	52.5	72.7
NORTH LITTLE ROCK, AR	30	49.1	55.1	64.1	73.2	80.5	88.6	93.5	92.6	85.0	74.8	61.6	51.9	72.5
BAKERSFIELD, CA	30	56.3	63.5	68.3	75.7	83.8	91.6	96.9	95.4	89.4	79.5	65.3	56.1	76.8
BISHOP, CA	30	53.6	58.4	64.3	72.1	81.2	91.5	97.9	95.8	87.6	76.0	62.4	54.3	74.6
EUREKA, CA.	30	55.0	55.9	56.1	57.4	59.6	61.8	63.3	63.9	63.6	61.3	58.0	55.1	59.3
FRESNO, CA	30	53.6	61.3	66.1	74.0	82.7	90.9	96.6	94.8	88.8	78.1	63.0	53.4	75.3
LONG BEACH, CA	30	68.0	68.5	68.9	72.7	74.0	78.3	82.9	84.6	83.1	78.9	73.4	68.8	75.2
LOS ANGELES AP, CA	30	65.6	65.8	65.3	68.0	69.3	72.6	75.3	76.8	76.5	74.3	70.4	66.7	70.6

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
LOS ANGELES C.O., CA	30	68.1	69.6	69.8	73.1	74.5	79.5	83.8	84.8	83.3	79.0	73.2	68.7	75.6
MOUNT SHASTA, CA	30	44.2	47.6	52.1	59.2	67.3	75.5	83.2	82.6	76.0	64.4	49.9	43.8	62.2
REDDING, CA	30	55.4	60.1	63.9	70.6	80.7	90.7	98.5	96.9	90.2	78.4	62.4	55.6	75.3
SACRAMENTO, CA	30	53.8	60.5	64.7	71.4	80.0	87.4	92.4	91.4	87.5	78.2	63.7	53.9	73.7
SAN DIEGO, CA	30	65.8	66.3	66.3	68.7	69.3	72.2	75.8	77.5	77.0	74.0	69.9	66.3	70.8
SAN FRANCISCO AP, CA	30	55.9	59.3	61.2	64.3	66.8	69.9	71.1	71.7	72.7	69.7	62.0	56.1	65.1
SAN FRANCISCO C.O., CA	30	58.1	61.4	62.5	64.5	65.4	67.7	68.2	69.2	71.3	70.4	64.1	58.6	65.1
SANTA BARBARA, CA	30	65.4	66.3	67.4	70.1	71.2	74.4	76.7	78.7	78.2	75.4	71.0	66.4	71.8
SANTA MARIA, CA	30	63.9	64.8	64.8	67.6	68.6	71.4	73.5	74.2	74.9	74.0	69.2	64.9	69.3
STOCKTON, CA	30	53.8	61.2	66.1	73.3	81.3	88.9	93.8	92.6	88.2	78.6	64.0	53.8	74.6
ALAMOSA, CO	30	33.1	40.2	49.6	58.7	68.3	78.4	81.7	78.9	72.5	61.7	45.7	34.8	58.6
COLORADO SPRINGS, CO	30	41.7	45.4	51.6	59.2	68.4	79.2	84.4	81.6	74.1	63.4	49.8	42.4	61.8
DENVER, CO	30	43.2	47.2	53.7	60.9	70.5	82.1	88.0	86.0	77.4	66.0	51.5	44.1	64.2
GRAND JUNCTION, CO	30	36.6	45.4	55.7	64.3	74.5	86.9	92.1	89.6	80.3	66.7	49.8	38.9	65.1
PUEBLO, CO	30	44.6	50.4	57.3	65.3	74.6	86.1	91.4	88.8	80.8	69.4	54.3	45.4	67.4
BRIDGEPORT, CT	30	36.9	38.8	46.9	57.0	67.4	76.4	81.9	80.7	73.6	63.1	52.6	42.1	59.8
HARTFORD, CT	30	34.1	37.7	47.7	59.9	71.7	80.0	84.9	82.5	74.3	63.1	50.9	39.0	60.5
WILMINGTON, DE	30	39.3	42.5	51.9	62.6	72.5	81.1	86.0	84.1	77.2	65.9	55.0	44.4	63.6
WASHINGTON DULLES AP, D.C.	30	41.4	45.5	55.0	65.9	74.6	82.8	87.4	85.9	78.9	67.7	56.5	45.9	65.6
WASHINGTON NAT'L AP, D.C.	30	42.5	46.5	55.7	66.3	75.4	83.9	88.3	86.3	79.3	68.0	57.3	47.0	66.4
APALACHICOLA, FL	30	62.4	64.8	69.9	76.0	83.0	88.3	89.8	89.4	87.0	79.9	72.0	65.0	77.3
DAYTONA BEACH, FL	30	69.7	71.1	75.6	79.8	85.0	88.8	91.0	90.1	87.9	82.6	76.9	71.4	80.8
FORT MYERS, FL	30	75.3	76.5	80.5	84.5	89.1	91.2	91.7	91.7	90.3	86.3	81.3	76.6	84.6
GAINESVILLE, FL	30	66.2	69.3	75.1	80.4	86.5	89.9	90.9	90.1	87.4	81.0	74.4	68.1	79.9
JACKSONVILLE, FL	30	64.2	67.3	73.4	78.6	84.3	88.7	90.8	89.4	86.1	79.1	72.5	65.8	78.4
KEY WEST, FL	30	75.3	75.9	78.8	81.9	85.4	88.1	89.4	89.5	88.2	84.7	80.6	76.7	82.9
MIAMI, FL	30	76.5	77.7	80.7	83.8	87.2	89.5	90.9	90.6	89.0	85.4	81.2	77.5	84.2
ORLANDO, FL	30	71.8	73.9	78.8	83.0	88.2	91.0	92.2	92.0	90.3	85.0	78.9	73.3	83.2
PENSACOLA, FL	30	61.2	64.4	70.2	76.2	83.4	89.0	90.7	90.1	87.0	79.3	70.3	63.4	77.1
TALLAHASSEE, FL	30	63.8	67.4	74.0	80.0	86.5	90.9	92.0	91.5	88.5	81.2	72.9	65.8	79.5
TAMPA, FL	30	70.1	71.6	76.3	80.6	86.3	88.9	89.7	90.0	89.0	84.1	78.0	72.0	81.4
VERO BEACH, FL	30	73.3	74.1	77.6	81.4	85.2	89.0	90.4	90.2	88.7	84.3	79.1	74.7	82.3
WEST PALM BEACH, FL	30	75.1	76.3	79.2	82.1	85.9	88.5	90.1	90.1	88.7	85.0	80.4	76.4	83.2
ATHENS, GA	30	51.4	56.5	64.7	73.0	80.5	87.2	90.2	88.2	82.5	72.9	63.2	54.2	72.0
ATLANTA, GA	30	51.9	56.8	65.0	72.9	80.0	86.5	89.4	87.9	82.3	72.9	63.3	54.6	72.0
AUGUSTA,GA	30	56.5	61.3	69.2	76.7	83.9	89.6	92.0	90.2	85.3	76.5	67.8	59.1	75.7
COLUMBUS, GA	30	56.9	61.6	69.4	76.5	83.2	89.5	91.7	91.0	86.0	77.0	67.6	59.2	75.8
MACON, GA	30	56.6	60.9	68.5	75.9	83.4	89.5	91.8	90.5	85.4	76.8	67.8	59.2	75.5
SAVANNAH, GA	30	60.4	64.1	71.0	77.7	84.3	89.5	92.3	90.3	86.0	78.1	70.5	62.6	77.2
HILO, HI	30	79.2	79.4	79.2	79.3	80.6	82.2	82.5	83.2	83.4	82.7	80.7	79.5	81.0
HONOLULU,HI	30	80.4	80.7	81.7	83.1	84.9	86.9	87.8	88.9	88.9	87.2	84.3	81.7	84.7
KAHULUI, HI	30	80.3	80.8	81.5	82.5	84.3	86.0	86.9	87.9	88.1	86.9	84.1	81.7	84.3
LIHUE, HI	30	77.9	77.9	78.1	78.8	80.6	82.7	83.9	84.9	85.0	83.5	81.0	79.0	81.1

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BOISE, ID	30	36.7	44.5	53.6	61.7	70.7	80.3	89.2	88.0	77.2	64.3	47.5	37.2	62.6
LEWISTON, ID	30	39.4	45.6	53.8	61.6	70.0	78.0	87.6	87.6	76.7	62.0	46.8	39.2	62.4
POCATELLO, ID	30	32.5	39.0	48.5	58.5	67.7	78.3	87.5	86.8	75.7	62.0	44.5	33.8	59.6
CHICAGO, IL	30	29.6	34.7	46.1	58.0	69.9	79.2	83.5	81.2	73.9	62.1	47.1	34.4	58.3
MOLINE, IL	30	29.8	35.6	48.3	61.7	73.3	82.7	86.1	83.9	76.5	64.4	48.0	34.5	60.4
PEORIA, IL	30	30.7	36.6	49.4	62.0	73.0	82.2	85.7	83.6	76.7	64.4	48.8	35.5	60.7
ROCKFORD, IL	30	27.2	33.0	45.5	59.1	71.2	79.9	83.1	80.9	73.9	61.8	45.5	32.0	57.8
SPRINGFIELD, IL	30	33.1	38.9	51.1	63.4	74.4	83.3	86.5	84.5	78.5	66.6	50.9	38.0	62.4
EVANSVILLE, IN	30	39.5	45.4	56.4	67.2	77.1	86.1	89.4	87.8	81.3	70.0	55.7	44.1	66.7
FORT WAYNE, IN	30	31.0	35.4	47.4	59.8	71.6	80.6	84.3	81.8	75.4	63.0	48.5	35.8	59.6
INDIANAPOLIS, IN	30	34.5	39.9	51.4	62.9	73.5	82.1	85.6	83.7	77.4	65.6	51.6	39.2	62.3
SOUTH BEND, IN	30	31.0	35.5	46.8	58.9	70.7	79.6	83.1	80.7	73.6	61.8	47.7	35.6	58.8
DES MOINES, IA	30	29.1	35.4	48.2	61.3	72.3	81.8	86.0	83.9	75.9	63.5	46.7	33.1	59.8
DUBUQUE, IA	30	24.8	30.8	43.3	57.4	69.3	78.6	82.1	79.8	71.9	60.3	43.6	29.7	56.0
SIOUX CITY, IA	30	28.7	35.0	47.3	61.7	73.2	82.5	86.2	83.7	76.0	63.7	44.8	31.7	59.6
WATERLOO, IA	30	25.8	31.9	45.0	59.7	72.2	81.7	85.0	82.8	75.3	62.5	45.0	30.7	58.1
CONCORDIA, KS	30	36.3	42.9	53.9	64.4	74.0	85.0	90.7	88.4	79.9	67.9	51.0	39.6	64.5
DODGE CITY, KS	30	41.4	48.3	57.3	67.1	75.9	86.9	92.8	90.8	82.0	70.4	54.5	44.4	67.7
GOODLAND, KS	30	39.4	45.0	53.2	62.7	71.7	83.6	89.1	86.7	78.0	66.0	49.6	41.3	63.9
TOPEKA, KS	30	37.2	43.8	55.5	66.1	75.3	84.5	89.1	87.9	80.3	68.9	53.1	40.9	65.2
WICHITA, KS	30	40.1	47.2	57.3	66.9	76.0	87.1	92.9	91.6	82.2	70.2	54.5	43.1	67.4
GREATER CINCINNATI, OH	30	38.0	43.1	53.9	64.7	74.4	82.4	86.4	84.8	78.0	66.4	53.6	42.7	64.0
JACKSON, KY	30	42.0	46.8	56.8	66.8	73.8	80.8	84.2	83.3	77.4	67.5	56.4	46.3	65.2
LEXINGTON, KY	30	39.9	45.2	55.3	65.1	74.0	82.3	85.9	84.6	78.1	66.9	54.5	44.3	64.7
LOUISVILLE, KY	30	41.0	46.6	56.8	66.8	75.4	83.3	87.0	85.8	79.4	68.4	55.9	45.4	66.0
PADUCAH, KY	30	41.9	48.0	58.1	68.4	76.9	85.2	88.6	87.4	81.2	70.8	57.2	46.3	67.5
BATON ROUGE, LA	30	60.0	63.9	71.0	77.3	84.0	89.2	90.7	90.9	87.4	79.7	70.1	62.8	77.3
LAKE CHARLES, LA	30	60.6	64.5	71.3	77.4	84.1	88.9	91.0	91.3	87.7	80.5	70.6	63.3	77.6
NEW ORLEANS, LA	30	61.8	65.3	72.1	78.0	84.8	89.4	91.1	91.0	87.1	79.7	71.0	64.5	78.0
SHREVEPORT, LA	30	56.2	62.0	69.7	76.6	83.2	89.8	93.3	93.4	87.6	78.3	66.8	58.5	76.3
CARIBOU, ME	30	19.3	23.2	34.1	47.0	62.6	71.8	76.3	74.2	64.1	51.4	37.4	24.8	48.9
PORTLAND, ME	30	30.9	34.1	42.2	52.8	63.3	72.8	78.8	77.3	68.9	57.9	47.1	36.4	55.2
BALTIMORE, MD	30	41.2	44.8	53.9	64.5	73.9	82.7	87.2	85.1	78.2	67.0	56.3	46.0	65.1
BLUE HILL, MA	30	33.8	36.3	44.8	55.5	67.0	75.5	81.2	78.9	71.0	60.3	49.3	38.6	57.7
BOSTON, MA	30	36.5	38.7	46.3	56.1	66.7	76.6	82.2	80.1	72.5	61.8	51.8	41.7	59.3
WORCESTER, MA	30	31.4	34.1	43.0	54.4	66.3	74.4	79.3	77.1	69.0	58.4	47.1	36.2	55.9
ALPENA, MI	30	26.1	28.2	37.3	50.3	64.3	73.8	79.0	76.1	67.4	55.6	42.2	31.2	52.6
DETROIT, MI	30	31.1	34.4	45.2	57.8	70.2	79.0	83.4	81.4	73.7	61.2	47.8	35.9	58.4
FLINT, MI	30	29.2	32.3	43.1	56.2	69.0	77.7	82.0	79.5	71.9	59.7	46.3	34.2	56.8
GRAND RAPIDS, MI	30	29.3	32.6	43.3	56.6	69.6	78.4	82.3	79.7	71.7	59.6	45.5	33.7	56.9
HOUGHTON LAKE, MI	30	25.9	29.3	39.4	53.0	67.2	75.5	80.0	77.1	68.3	56.0	41.9	30.5	53.7
LANSING, MI	30	29.4	32.6	43.5	56.6	69.4	78.1	82.1	79.7	72.0	59.8	46.0	34.1	56.9
MARQUETTE, MI	30	19.7	24.2	33.1	45.8	61.5	70.3	75.2	72.6	63.2	50.9	35.4	24.1	48.0

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
MUSKEGON, MI	30	29.8	32.5	42.5	54.6	67.0	75.6	80.0	78.1	70.3	58.7	45.6	34.6	55.8
SAULT STE. MARIE, MI	30	21.5	24.5	33.6	48.0	63.2	70.7	75.7	74.1	64.8	52.8	38.9	27.2	49.6
DULUTH, MN	30	17.9	24.4	34.2	49.0	63.4	71.2	76.3	73.9	64.5	52.5	35.2	22.3	48.7
INTERNATIONAL FALLS, MN	30	13.8	22.4	34.9	51.5	66.6	74.2	78.6	76.3	64.7	51.7	32.5	18.1	48.8
MINNEAPOLIS-ST.PAUL, MN	30	21.9	28.4	40.6	57.0	70.1	79.0	83.3	80.4	71.1	58.4	40.1	26.4	54.7
ROCHESTER, MN	30	19.9	26.2	38.7	54.8	67.7	76.6	80.1	77.5	69.2	56.9	38.7	24.5	52.6
SAINT CLOUD, MN	30	18.7	25.7	37.7	54.9	69.0	77.3	81.7	78.9	69.0	56.3	37.2	23.2	52.5
JACKSON, MS	30	55.1	60.3	68.1	75.0	82.1	88.9	91.4	91.4	86.4	76.8	66.3	57.9	75.0
MERIDIAN, MS	30	57.5	62.6	70.3	77.1	83.9	90.1	92.9	92.9	88.0	78.3	68.5	60.5	76.9
TUPELO, MS	30	50.3	56.0	64.8	73.5	81.0	88.0	91.4	90.9	84.9	74.9	63.0	53.6	72.7
COLUMBIA, MO	30	37.4	43.9	55.1	65.9	74.6	83.6	88.6	87.3	79.1	68.0	53.4	41.5	64.9
KANSAS CITY, MO	30	36.0	42.6	54.4	65.2	74.6	83.9	88.8	87.1	79.0	67.6	52.0	40.0	64.3
ST. LOUIS, MO	30	37.9	44.3	55.4	66.7	76.5	85.3	89.8	87.9	80.1	68.3	53.8	42.0	65.7
SPRINGFIELD, MO	30	41.6	47.7	57.8	67.7	75.9	84.6	89.9	89.5	81.2	70.6	56.4	45.5	67.4
BILLINGS, MT	30	32.8	39.5	47.6	57.5	67.4	78.0	85.8	84.5	71.8	58.9	42.7	34.5	58.4
GLASGOW, MT	30	19.9	28.3	41.3	56.7	67.9	77.1	83.8	83.3	70.4	57.1	37.4	24.8	54.0
GREAT FALLS, MT	30	32.1	37.7	45.3	55.6	64.7	73.9	82.0	81.2	69.6	58.0	42.1	34.2	56.4
HAVRE, MT	30	25.5	33.4	44.9	58.5	68.8	77.4	84.6	83.9	71.9	59.4	40.8	30.1	56.6
HELENA, MT	30	30.5	37.3	46.8	56.9	65.9	75.0	83.4	82.5	71.0	58.4	41.5	31.5	56.7
KALISPELL, MT	30	28.9	35.2	44.9	56.0	64.7	71.9	80.2	80.5	69.0	55.3	38.6	30.1	54.6
MISSOULA, MT	30	30.8	37.4	48.1	58.0	66.1	74.5	83.6	83.2	71.5	57.4	40.0	30.3	56.7
GRAND ISLAND, NE	30	32.6	38.6	49.5	61.9	71.9	83.0	87.1	84.8	76.9	64.6	46.8	35.3	61.1
LINCOLN, NE	30	33.2	39.3	51.2	63.5	73.8	84.9	89.6	87.1	78.8	66.5	49.1	36.8	62.8
NORFOLK, NE	30	31.2	37.3	48.5	61.3	72.3	82.3	86.5	84.4	76.4	64.0	45.5	33.6	60.3
NORTH PLATTE, NE	30	36.5	43.3	52.1	62.7	72.0	82.6	88.4	86.8	78.0	65.6	48.5	39.2	63.0
OMAHA EPPLEY AP, NE	30	31.7	37.9	50.4	63.2	73.7	83.7	87.4	85.2	77.3	65.2	47.8	34.8	61.5
OMAHA (NORTH), NE	30	32.1	38.0	50.8	63.6	73.3	82.4	85.6	83.9	76.3	64.6	47.5	35.1	61.1
SCOTTSBLUFF, NE	30	38.0	44.3	51.7	61.0	71.1	82.2	88.7	86.8	77.3	64.4	48.2	39.8	62.8
VALENTINE, NE	30	33.8	39.4	48.4	59.8	71.2	81.9	88.3	86.9	77.2	63.5	45.9	36.7	61.1
ELKO, NV	30	37.1	42.9	51.2	59.3	68.6	79.9	89.6	88.1	78.2	65.0	48.1	38.2	62.2
ELY, NV	30	40.0	44.0	49.9	57.9	67.3	79.2	87.3	85.1	75.8	63.0	48.8	41.0	61.6
LAS VEGAS, NV	30	57.1	63.0	69.5	78.1	87.8	98.9	104.1	101.8	93.8	80.8	66.0	57.3	79.9
RENO, NV	30	45.5	51.7	57.2	64.1	72.6	82.8	91.2	89.9	81.7	69.9	55.3	46.4	67.4
WINNEMUCCA, NV	30	41.6	48.5	55.1	62.6	72.0	82.7	92.2	90.6	80.4	67.3	51.4	42.2	65.6
CONCORD, NH	30	30.6	34.1	43.8	56.9	69.6	77.9	82.9	80.8	72.1	60.5	47.6	35.6	57.7
MT. WASHINGTON, NH	30	14.0	14.8	21.3	29.4	41.6	50.3	54.1	53.0	46.1	36.4	27.6	18.5	33.9
ATLANTIC CITY AP, NJ	30	41.4	43.9	51.9	61.3	71.1	80.0	85.1	83.3	76.6	66.3	56.0	46.4	63.6
ATLANTIC CITY C.O.,NJ	30	41.4	43.2	49.5	57.5	66.1	74.8	80.6	79.8	74.1	64.5	55.0	46.3	61.1
NEWARK, NJ	30	38.1	41.1	50.1	60.8	71.4	80.2	85.2	83.2	75.7	64.7	53.7	43.0	62.3
ALBUQUERQUE, NM	30	47.6	54.6	62.4	70.6	79.7	90.2	92.3	89.0	82.2	70.7	57.1	47.9	70.4
CLAYTON, NM	30	47.4	51.5	58.2	66.1	74.2	83.9	87.4	85.1	77.9	68.5	55.7	48.0	67.0
ROSWELL, NM	30	55.6	62.0	70.0	77.7	86.0	94.0	94.8	92.3	85.7	76.5	64.5	56.3	76.3
ALBANY, NY	30	31.1	34.3	44.5	57.3	69.8	77.5	82.2	79.7	71.3	59.7	47.5	36.0	57.6

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BINGHAMTON, NY	30	28.4	30.9	40.6	53.1	65.6	73.4	78.1	75.8	67.8	56.7	44.3	33.4	54.0
BUFFALO, NY	30	31.1	33.2	42.5	54.1	66.4	74.8	79.6	77.8	70.1	58.9	46.7	36.0	55.9
ISLIP, NY	30	39.1	40.5	48.5	58.1	68.9	77.4	83.2	81.7	74.9	64.0	53.7	43.9	61.2
NEW YORK C.PARK, NY	30	38.0	41.0	49.8	60.7	70.9	79.0	84.2	82.4	74.7	63.5	53.1	42.9	61.7
NEW YORK (JFK AP), NY	30	38.8	40.9	48.9	58.6	68.3	77.2	82.9	81.8	74.9	64.3	53.8	44.0	61.2
NEW YORK (LAGUARDIA AP), NY	30	38.6	41.2	49.6	60.0	70.6	79.3	84.7	83.1	75.6	64.5	53.6	43.7	62.1
ROCHESTER, NY	30	31.2	33.2	42.7	55.2	67.9	76.6	81.4	79.1	71.1	59.7	47.2	36.1	56.8
SYRACUSE, NY	30	31.4	33.5	43.1	55.7	68.5	77.0	81.7	79.6	71.4	59.8	47.4	36.3	57.1
ASHEVILLE, NC	30	45.9	50.0	57.7	66.5	73.5	80.0	83.3	81.7	76.0	67.1	57.4	49.3	65.7
CAPE HATTERAS, NC	30	53.6	54.6	60.2	67.7	74.9	81.5	85.4	84.8	81.1	72.6	64.8	57.3	69.9
CHARLOTTE, NC	30	51.3	55.9	64.1	72.8	79.7	86.6	90.1	88.4	82.3	72.6	62.8	54.0	71.7
GREENSBORO-WNSTN-SALM-HGHPT,NC	30	47.2	51.7	60.3	69.7	76.9	83.8	87.6	85.7	79.4	69.6	59.9	50.6	68.5
RALEIGH, NC	30	49.8	54.0	62.5	71.8	78.7	85.5	89.1	87.2	81.3	71.8	62.4	53.3	70.6
WILMINGTON, NC	30	56.3	59.5	66.2	74.1	80.6	86.4	89.9	88.3	84.1	75.6	67.8	59.6	74.0
BISMARCK, ND	30	21.1	28.5	40.2	55.9	69.1	77.8	84.5	83.3	71.6	58.2	38.2	25.7	54.5
FARGO, ND	30	15.9	22.8	35.3	54.5	69.5	77.4	82.2	81.0	69.9	56.1	35.2	20.8	51.7
GRAND FORKS, ND	30	14.9	22.4	34.3	53.6	70.0	77.6	81.9	81.0	69.7	55.6	34.1	20.1	51.3
WILLISTON, ND	30	19.4	27.6	40.1	56.0	68.2	77.3	83.4	82.8	70.0	57.0	36.2	24.0	53.5
AKRON, OH	30	32.9	36.8	47.5	59.0	69.8	78.2	82.3	80.3	72.8	61.1	48.7	37.7	58.9
CLEVELAND, OH	30	32.6	35.8	46.1	57.3	68.6	77.4	81.4	79.2	72.3	60.8	48.7	37.4	58.1
COLUMBUS, OH	30	36.2	40.5	51.7	62.9	73.3	81.6	85.3	83.8	77.1	65.4	52.4	41.0	62.6
DAYTON, OH	30	33.7	38.2	49.3	60.7	71.2	80.1	84.2	82.3	75.6	63.5	50.1	38.5	60.6
MANSFIELD, OH	30	32.4	35.9	46.6	58.4	69.3	77.8	81.8	79.7	73.0	61.7	48.7	37.2	58.6
TOLEDO, OH	30	31.4	35.1	46.5	58.9	70.7	79.5	83.4	81.0	74.0	62.1	48.3	36.0	58.9
YOUNGSTOWN, OH	30	32.4	36.0	46.3	58.2	69.0	77.1	81.0	79.3	72.1	60.7	48.4	37.3	58.2
OKLAHOMA CITY, OK	30	47.1	53.5	62.5	71.2	78.9	87.2	93.1	92.5	84.1	73.4	59.6	49.8	71.1
TULSA, OK	30	46.5	52.9	62.4	72.1	79.6	88.0	93.8	93.2	84.1	74.0	60.0	49.6	71.4
ASTORIA, OR	30	48.1	50.8	53.3	56.1	60.0	63.6	67.2	68.3	67.5	61.0	53.1	48.4	58.1
BURNS,OR	30	34.7	40.5	49.0	57.4	66.1	75.1	85.4	84.5	75.0	62.4	44.8	35.1	59.2
EUGENE, OR	30	46.5	50.7	55.9	60.6	66.8	73.3	81.5	81.9	76.6	64.6	52.1	45.7	63.0
MEDFORD, OR	30	47.3	53.8	58.3	64.3	72.2	81.2	90.2	90.1	83.5	70.0	52.8	45.2	67.4
PENDLETON, OR	30	40.1	46.5	54.8	62.2	70.2	78.7	87.7	86.6	77.1	63.8	48.5	40.0	63.0
PORTLAND, OR	30	45.6	50.3	55.7	60.5	66.7	72.7	79.3	79.7	74.6	63.3	51.8	45.4	62.1
SALEM, OR	30	47.0	51.2	56.3	61.1	67.5	74.0	81.5	81.9	76.6	64.5	52.4	46.4	63.4
SEXTON SUMMIT, OR	30	42.5	44.1	46.7	51.9	60.1	67.5	75.5	75.7	70.3	59.3	45.7	42.0	56.8
GUAM, PC	30	84.0	84.0	85.0	86.2	87.3	87.4	86.8	86.1	86.5	86.3	85.6	84.7	85.8
JOHNSTON ISLAND, PC	30	81.9	82.1	82.3	83.1	84.3	85.8	86.5	87.2	87.0	86.2	84.1	82.6	84.4
KOROR, PC	30	87.6	87.5	88.3	88.8	89.1	88.1	87.5	87.5	88.0	88.3	89.0	88.4	88.2
KWAJALEIN, MARSHALL IS., PC	30	85.6	86.1	86.7	86.5	86.7	86.5	86.6	86.9	87.0	86.9	86.5	85.8	86.5
MAJURO, MARSHALL IS, PC	30	85.2	85.6	85.9	85.7	86.0	86.0	85.9	86.4	86.6	86.6	86.3	85.5	86.0
PAGO PAGO, AMER SAMOA, PC	30	86.8	87.2	87.3	86.9	85.6	84.5	83.8	84.0	84.8	85.2	85.8	86.9	85.7
POHNPEI, CAROLINE IS., PC	30	86.8	87.0	87.5	87.6	87.8	87.8	88.2	88.6	88.8	88.7	88.6	87.3	87.9
CHUUK, E. CAROLINE IS., PC	30	87.0	86.4	86.7	87.1	87.6	87.2	87.7	87.4	87.8	88.3	88.3	87.7	87.4

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
WAKE ISLAND, PC	30	82.4	82.1	83.3	84.5	86.2	88.1	88.8	88.7	88.7	87.8	85.7	83.9	85.9
YAP, W CAROLINE IS., PC	30	86.5	86.7	87.5	88.3	88.5	87.7	87.2	87.1	87.4	87.6	87.7	87.0	87.4
ALLENTOWN, PA	30	35.0	38.7	48.7	60.1	70.9	79.3	83.9	81.7	74.0	62.9	51.2	40.0	60.5
ERIE, PA.	30	33.5	35.4	44.7	55.6	67.4	76.2	80.4	79.0	72.0	61.0	49.3	38.6	57.8
HARRISBURG, PA	30	37.5	40.9	50.9	62.6	72.6	80.8	85.7	83.7	75.7	64.3	52.5	41.7	62.4
MIDDLETOWN/HARRISBURG INTL APT	30	37.5	40.9	50.9	62.6	72.6	80.8	85.7	83.7	75.7	64.3	52.5	41.7	62.4
PHILADELPHIA, PA	30	39.0	42.1	51.3	62.0	72.1	80.6	85.5	84.0	76.7	65.7	54.8	44.2	63.2
PITTSBURGH, PA	30	35.1	38.8	49.5	60.7	70.8	79.1	82.7	81.1	74.2	62.5	50.5	39.8	60.4
AVOCA, PA	30	34.1	37.3	47.3	59.2	70.8	78.2	82.6	80.5	72.4	61.2	49.3	38.6	59.3
WILLIAMSPORT, PA	30	33.2	37.1	47.8	60.2	71.3	78.9	83.2	81.4	73.3	61.8	49.0	37.8	59.6
PROVIDENCE, RI	30	37.1	39.3	47.7	58.1	68.5	77.3	82.6	80.9	73.4	62.9	52.4	42.1	60.2
CHARLESTON AP,SC	30	58.9	62.3	69.3	76.1	82.9	87.9	90.9	89.4	85.0	77.0	69.6	61.6	75.9
CHARLESTON C.O.,SC	30	57.1	59.8	65.8	72.9	79.6	84.9	88.5	87.1	83.0	75.1	67.6	60.0	73.5
COLUMBIA, SC	30	55.1	59.5	67.4	75.7	83.1	89.1	92.1	90.0	84.8	75.8	66.7	57.8	74.8
GREENVILLE-SPARTANBURG AP, SC	30	50.2	54.8	62.7	71.0	78.2	85.1	88.8	87.1	81.1	71.4	61.3	52.7	70.4
ABERDEEN, SD	30	21.4	28.5	40.2	57.4	70.2	78.7	84.7	83.5	73.0	59.2	38.8	25.7	55.1
HURON, SD	30	24.8	31.3	43.0	58.3	70.5	80.3	86.1	84.4	74.7	60.9	41.4	28.8	57.1
RAPID CITY, SD	30	33.6	38.6	46.6	57.1	67.2	77.4	85.5	85.5	75.2	61.7	44.8	36.1	59.1
SIOUX FALLS, SD	30	25.2	31.6	43.8	58.8	71.0	80.6	85.6	83.2	74.2	61.1	41.9	28.8	57.2
BRISTOL-JHNSN CTY-KNGSPRT,TN	30	44.1	48.9	58.4	67.1	74.9	81.8	84.8	83.9	78.5	68.2	57.4	47.8	66.3
CHATTANOOGA, TN	30	48.8	54.1	62.8	72.1	79.1	86.2	89.8	88.7	82.5	72.3	61.1	52.0	70.8
KNOXVILLE, TN	30	46.3	51.7	60.3	69.0	76.3	83.6	86.9	86.4	80.7	69.9	59.0	49.8	68.3
MEMPHIS, TN	30	48.6	54.4	63.3	72.4	80.4	88.5	92.1	91.2	85.3	75.1	62.1	52.2	72.1
NASHVILLE, TN	30	45.6	51.4	60.7	69.8	77.5	85.1	88.7	87.8	81.5	71.1	59.0	49.4	69.0
OAK RIDGE,TN	30	45.9	51.6	61.0	70.5	77.8	84.9	88.1	87.2	81.1	71.1	59.0	49.0	68.9
ABILENE, TX	30	55.2	60.7	69.1	77.3	84.7	91.1	94.8	93.7	86.7	77.6	65.1	56.9	76.1
AMARILLO, TX	30	48.9	54.1	62.2	70.6	78.6	87.4	91.0	88.7	81.8	71.8	58.4	49.8	70.3
AUSTIN/CITY, TX	30	60.3	65.1	72.5	78.9	84.8	90.9	95.0	95.6	90.1	81.4	70.1	62.3	78.9
AUSTIN/BERGSTROM, TX	30	58.9	64.1	71.4	77.8	84.3	89.9	94.0	94.0	89.7	80.8	69.7	61.3	78.0
BROWNSVILLE, TX	30	68.7	72.2	78.0	82.3	86.9	90.5	92.4	92.6	89.4	84.0	76.8	70.2	82.0
CORPUS CHRISTI, TX	30	66.0	69.7	75.8	80.7	85.6	90.2	93.2	93.4	89.9	83.6	74.9	68.0	80.9
DALLAS-FORT WORTH, TX	30	54.1	60.1	68.3	75.9	83.2	91.1	95.4	94.8	87.7	77.9	65.1	56.5	75.8
DALLAD-LOVE FIELD, TX	30	55.4	61.0	69.1	76.5	83.8	91.6	96.1	95.8	88.5	78.6	66.0	57.4	76.7
DEL RIO, TX	30	62.8	68.0	76.0	82.7	88.7	93.7	96.2	96.0	90.6	81.7	70.9	63.5	80.9
EL PASO, TX	30	57.2	63.4	70.2	78.1	86.7	95.3	94.5	92.0	87.1	77.9	65.5	57.4	77.1
GALVESTON, TX	30	61.9	64.4	70.0	75.2	81.4	86.6	88.7	89.3	86.5	79.7	71.3	64.3	76.6
HOUSTON, TX	30	62.3	66.5	73.3	79.1	85.5	90.7	93.6	93.5	89.3	82.0	72.0	64.6	79.4
LUBBOCK, TX	30	51.9	57.8	66.2	74.7	82.8	90.0	91.9	90.0	83.4	74.4	61.6	53.2	73.2
MIDLAND-ODESSA, TX	30	56.8	63.0	70.9	78.8	86.8	92.7	94.3	92.8	86.1	77.4	65.8	58.4	77.0
PORT ARTHUR, TX	30	61.5	65.3	72.0	77.8	84.3	89.4	91.6	91.7	88.0	80.5	70.9	63.9	78.1
SAN ANGELO, TX	30	57.9	63.5	71.1	79.0	85.6	90.8	94.4	93.1	86.6	77.8	66.5	59.3	77.2
SAN ANTONIO, TX	30	62.1	67.1	74.3	80.4	86.0	91.4	94.6	94.7	90.0	82.0	71.4	64.0	79.8
VICTORIA, TX	30	62.8	66.6	73.4	79.2	85.1	90.3	93.4	93.7	89.9	83.0	73.0	65.2	79.6

Normal Daily Maximum Temperature, Deg F

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
WACO, TX	30	57.0	62.3	70.2	77.6	84.8	92.0	96.7	96.9	90.1	80.4	67.8	59.1	77.9
WICHITA FALLS, TX	30	52.1	58.1	67.2	75.5	83.5	91.7	97.2	95.8	87.5	77.1	63.7	54.5	75.3
MILFORD, UT	30	40.6	47.1	56.7	65.0	74.2	86.2	92.9	90.7	81.3	68.0	52.2	42.2	66.4
SALT LAKE CITY, UT	30	37.0	43.4	52.8	60.9	70.6	82.2	90.6	88.7	77.6	64.0	48.7	38.0	62.9
BURLINGTON, VT	30	26.7	29.0	39.6	53.3	67.8	76.5	81.4	78.4	68.9	56.4	44.0	32.3	54.5
LYNCHBURG, VA	30	44.5	48.6	57.6	68.0	75.5	82.5	86.4	85.1	78.3	68.4	58.0	48.4	66.8
NORFOLK, VA	30	47.8	50.3	57.8	67.0	74.9	82.8	86.8	84.7	79.4	69.4	60.9	52.3	67.8
RICHMOND, VA	30	45.3	49.3	58.4	68.9	76.2	83.6	87.5	85.7	79.7	69.3	59.7	49.7	67.8
ROANOKE, VA	30	45.0	49.1	57.9	68.0	75.9	83.3	87.5	86.0	78.8	68.6	58.0	48.6	67.2
OLYMPIA, WA	30	44.4	48.3	53.0	58.2	64.6	70.0	76.1	77.0	71.7	60.4	49.6	43.8	59.8
QUILLAYUTE, WA	30	46.6	49.2	51.8	55.7	60.4	63.8	68.2	69.3	67.3	59.2	50.8	46.5	57.4
SEATTLE C.O., WA	30	46.9	50.5	54.5	59.3	64.9	69.5	74.5	74.9	69.9	60.3	51.5	46.5	60.3
SEATTLE SEA-TAC AP, WA	30	45.8	49.5	53.2	58.2	64.4	69.6	75.3	75.6	70.2	59.7	50.5	45.5	59.8
SPOKANE, WA	30	32.8	39.3	48.6	57.5	66.2	73.9	82.5	82.6	72.5	58.5	41.1	32.8	57.4
WALLA WALLA WASHINGTON	30	40.6	46.9	56.0	64.1	72.0	80.3	89.9	89.1	79.3	65.8	50.1	40.8	64.6
YAKIMA, WA	30	37.7	45.6	56.0	64.1	72.4	79.6	87.2	86.5	77.6	64.3	47.7	37.1	63.0
SAN JUAN, PR	30	82.4	82.8	83.4	84.9	86.3	87.6	87.4	87.8	87.8	87.5	85.1	83.2	85.5
BECKLEY, WV	30	38.8	42.8	51.9	62.5	70.6	77.0	80.2	78.9	72.6	63.1	52.4	43.1	61.2
CHARLESTON, WV	30	42.6	47.0	56.6	66.7	74.6	81.5	84.9	83.5	77.3	67.1	56.4	46.8	65.4
ELKINS, WV	30	39.3	43.5	53.2	63.2	71.7	78.5	81.7	80.4	74.1	64.1	52.8	43.5	62.2
HUNTINGTON, WV	30	41.0	46.1	56.3	66.6	74.6	81.7	85.1	83.7	77.0	66.4	55.1	45.3	64.9
GREEN BAY, WI	30	24.1	28.9	40.0	54.6	68.0	76.8	81.2	78.5	70.2	57.9	42.4	29.0	54.3
LA CROSSE, WI	30	25.5	32.4	44.6	59.7	72.5	81.3	85.2	82.5	73.7	61.1	43.6	29.9	57.7
MADISON, WI	30	25.2	30.8	42.8	56.6	69.4	78.3	82.1	79.4	71.4	59.6	43.3	30.2	55.8
MILWAUKEE, WI	30	28.0	32.5	42.6	53.9	66.0	76.3	81.1	79.1	71.9	60.2	45.7	33.1	55.9
CASPER, WY	30	32.3	37.0	46.9	56.1	66.4	78.8	86.8	85.3	73.4	59.5	42.6	33.6	58.2
CHEYENNE, WY	30	37.1	40.5	46.4	54.4	64.4	75.4	81.9	79.8	70.3	58.2	44.5	38.1	57.6
LANDER, WY	30	31.9	37.4	47.5	56.5	66.5	78.5	86.3	84.8	73.0	59.5	41.8	32.6	58.0
SHERIDAN, WY	30	33.0	39.0	48.2	57.5	66.4	76.4	85.2	84.9	73.1	59.8	43.4	34.4	58.5

 [Top of Page](#)

 [NCDC](#) / [Get/View Data](#) / [Comparative Climatic Data](#) / [Search](#)

<http://www.ncdc.noaa.gov/oa/climate/online/ccd/maxtemp.html>

Downloaded Thursday, 06-May-2004 17:37:17 EDT

Last Updated Monday, 21-Apr-2003 09:10:44 EDT by Dan.Dellinger@noaa.gov

Please see the [NCDC Contact Page](#) if you have questions or comments.

Average Relative Humidity(%)

Morning (M), Afternoon (A)

DATA THROUGH 2002	YEARS		JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANN	
	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A	M	A
BIRMINGHAM AP,AL	39	39	80	64	79	60	79	57	83	57	86	60	84	59	86	62	86	61	87	62	87	58	83	60	81	63	83	60
HUNTSVILLE, AL	35	35	82	68	80	63	80	60	82	57	86	60	88	61	90	64	91	63	89	63	87	59	84	62	82	67	85	62
MOBILE, AL	40	40	83	65	83	61	85	60	88	58	88	60	89	61	90	66	91	66	90	65	87	59	86	62	85	66	87	62
MONTGOMERY, AL	39	39	82	64	80	60	82	57	86	57	88	60	88	60	90	64	91	64	89	62	89	58	87	60	84	64	86	61
ANCHORAGE, AK	49	49	75	73	75	68	70	57	66	53	63	49	67	56	74	63	78	65	80	64	78	66	78	74	77	76	73	64
ANNETTE, AK	37	37	81	77	80	73	77	69	76	66	76	66	79	69	81	71	84	73	86	75	85	78	83	79	83	80	81	73
BARROW, AK	51	51	69	69	66	67	67	68	75	74	85	82	87	84	88	84	92	86	91	87	85	84	78	79	73	73	80	78
BARTER IS.,AK	40	40	70	70	69	67	67	67	73	74	86	84	89	87	89	86	91	88	90	87	84	83	75	75	70	70	79	78
BETHEL, AK	52	52	78	77	76	74	80	75	83	72	80	62	78	60	86	68	91	73	92	71	88	76	84	81	78	78	83	72
BETTLES,AK	52	52	69	68	67	64	67	60	66	60	62	50	60	47	69	53	79	61	79	62	78	72	73	72	70	70	70	62
BIG DELTA,AK	43	43	65	64	68	61	64	52	57	44	50	38	57	44	64	49	69	51	70	53	74	66	69	67	68	68	65	55
COLD BAY,AK	33	33	85	83	85	81	85	78	84	77	84	75	87	77	90	82	91	82	88	79	84	77	84	81	84	83	86	79
FAIRBANKS, AK	50	50	70	71	68	65	68	53	60	45	53	37	60	43	70	50	78	55	79	55	80	68	75	74	72	73	69	57
GULKANA,AK	50	50	72	71	73	67	70	54	64	45	58	40	60	42	68	48	71	49	75	52	79	65	76	75	73	73	70	57
HOMER, AK	53	53	78	75	78	70	75	65	72	63	70	63	71	64	76	69	79	69	80	68	79	66	77	72	78	76	76	68
JUNEAU, AK	36	36	78	74	81	71	79	66	77	61	75	61	75	61	79	67	82	70	86	74	84	76	81	77	81	79	80	70
KING SALMON, AK	54	54	79	76	78	71	78	67	77	62	73	56	77	59	83	64	86	67	86	66	85	68	83	77	79	77	80	68
KODIAK, AK	55	55	79	76	79	73	76	69	74	69	76	72	79	75	82	77	80	74	81	73	78	68	78	72	77	74	78	73
KOTZEBUE, AK	39	39	73	73	73	73	73	71	78	75	82	78	81	77	83	77	85	77	83	74	82	77	78	77	75	75	79	75
MCGRATH, AK	48	48	73	72	73	64	73	53	68	49	63	44	66	47	75	56	83	62	84	61	84	70	79	76	76	75	75	61
NOME, AK	39	39	74	74	73	72	73	70	76	74	76	73	76	73	82	78	83	79	81	73	80	71	77	75	74	74	77	74
ST. PAUL ISLAND, AK	24	24	84	83	86	84	87	83	86	81	89	81	92	83	95	89	95	89	90	83	83	78	82	80	84	83	88	83
TALKEETNA, AK	51	51	73	69	74	64	71	57	67	52	65	49	70	53	79	61	84	64	84	64	80	67	75	71	73	73	75	62
UNALAKLEET, AK	10	10	67	69	71	73	71	70	76	74	76	71	80	74	81	75	82	73	80	69	77	71	74	73	68	69	75	72
VALDEZ, AK	30	30	75	74	74	68	72	64	71	61	73	61	78	64	84	71	85	72	87	74	78	70	74	70	76	75	77	69
YAKUTAT, AK	38	38	85	82	86	77	83	71	78	69	78	71	81	74	85	78	86	79	89	78	89	79	87	82	86	85	84	77
FLAGSTAFF, AZ	45	45	74	50	74	45	72	41	67	32	63	27	54	21	67	37	77	44	74	37	72	36	70	43	72	51	70	39
PHOENIX, AZ	42	42	64	32	59	27	56	24	42	17	34	14	30	12	43	20	50	23	48	23	49	22	56	27	65	33	50	23
TUCSON, AZ	62	62	62	32	58	27	53	23	42	16	34	13	32	13	56	28	65	33	55	27	52	25	54	28	62	34	52	25
WINSLOW, AZ	25	25	76	47	68	33	61	25	52	20	43	16	37	14	58	27	65	30	65	29	60	26	66	33	75	47	60	29
YUMA, AZ	14	14	57	28	56	24	52	21	47	17	44	15	41	13	49	22	55	24	57	24	54	23	56	27	58	32	52	22
FORT SMITH, AR	38	38	82	65	80	60	79	57	82	56	88	62	89	62	88	60	88	58	89	60	87	57	84	61	83	65	85	60
LITTLE ROCK, AR	38	38	80	65	79	61	78	59	82	60	87	62	85	58	86	58	85	58	86	59	84	55	81	60	79	63	83	60
BAKERSFIELD, CA	26	26	85	63	80	53	74	44	67	33	57	27	52	24	49	23	53	25	57	28	62	34	77	50	83	61	66	39
BISHOP, CA	7	7	67	32	68	31	58	20	53	17	49	15	39	14	46	14	45	14	50	16	50	16	63	24	64	29	54	20
BLUE CANYON, CA	13	13	56	58	61	61	66	61	61	54	55	47	47	38	41	34	42	34	48	42	50	48	57	60	55	59	53	50
FRESNO, CA	39	39	91	68	89	56	86	47	80	35	71	27	65	24	61	22	66	24	71	28	77	35	87	54	91	68	78	41
LONG BEACH, CA	32	32	76	53	78	54	80	55	80	51	81	55	82	56	82	54	82	53	83	54	81	54	79	53	77	52	80	54

LOS ANGELES AP, CA	43	43	71	61	75	64	79	66	80	65	83	67	85	68	86	69	85	69	84	68	80	66	72	62	68	60	79	65
LOS ANGELES C.O., CA	43	43	64	50	70	52	74	52	79	54	80	55	80	54	80	52	79	53	75	52	72	54	59	47	59	48	73	52
MOUNT SHASTA, CA	13	13	76	66	75	60	75	52	71	43	69	39	67	36	64	28	65	29	66	33	71	46	78	62	77	67	71	47
REDDING, CA	16	16	84	61	82	51	78	46	76	38	72	33	63	25	60	20	60	19	61	23	68	30	82	51	83	59	72	38
SACRAMENTO, CA	16	16	91	70	89	61	86	53	83	44	82	38	78	32	77	30	78	29	77	31	79	37	87	57	88	67	83	46
SAN DIEGO, CA	42	42	72	58	74	60	76	61	76	60	78	65	81	67	82	67	83	67	81	67	77	65	73	62	71	59	77	63
SAN FRANCISCO AP, CA	43	43	86	68	85	66	82	63	82	60	83	60	84	59	86	60	87	61	85	59	82	59	84	64	85	68	84	62
SAN FRANCISCO C.O., CA	8	8	81	63	83	63	80	61	82	61	88	68	78	63	80	65	80	64	75	58	70	52	71	55	69	55	78	61
SANTA BARBARA, CA	6	6	80	57	79	58	83	60	76	58	83	60	88	62	90	64	90	64	86	63	81	62	77	52	81	55	83	60
SANTA MARIA, CA	26	26	82	61	85	62	86	65	89	61	91	61	92	61	89	62	90	62	92	63	85	62	80	62	80	59	87	62
STOCKTON, CA	26	26	90	71	89	61	84	50	80	41	74	34	71	29	68	28	69	29	71	32	75	38	83	57	91	71	79	45
ALAMOSA, CO	45	45	78	57	78	48	74	36	71	30	72	28	74	25	83	35	85	38	81	33	76	34	78	47	77	56	77	39
COLORADO SPRINGS, CO	42	42	58	46	59	40	62	39	63	35	68	37	67	35	69	39	71	43	67	38	59	37	61	46	57	49	63	40
DENVER, CO	35	35	63	49	67	44	67	40	67	35	70	38	69	35	68	34	69	35	68	34	65	36	68	49	65	52	67	40
GRAND JUNCTION, CO	39	39	78	62	73	47	64	35	58	28	54	25	44	19	48	22	52	24	53	27	59	33	71	47	77	59	61	36
PUEBLO, CO	23	23	69	49	66	37	68	34	68	31	70	32	70	28	74	32	76	35	72	32	69	33	74	46	69	51	70	37
BRIDGEPORT, CT	36	36	70	59	70	57	70	55	69	53	75	59	78	61	78	60	79	61	82	61	80	59	77	60	74	60	75	59
HARTFORD, CT	43	43	72	57	72	53	73	51	70	45	74	48	77	51	79	51	83	53	86	55	84	51	79	56	76	59	77	52
WILMINGTON, DE	55	55	76	60	75	56	74	53	73	50	76	54	78	54	79	54	83	56	85	56	85	54	80	56	77	59	78	55
WASHINGTON DULLES AP, D.C.	33	33	77	58	78	54	78	52	77	49	83	55	84	56	86	55	88	55	90	56	89	54	83	54	79	58	83	55
WASHINGTON NAT'L AP, D.C.	42	42	71	56	71	53	70	50	70	49	75	53	76	53	76	53	80	55	82	56	80	54	76	54	72	57	75	54
APALACHICOLA, FL	42	42	85	66	86	65	86	65	86	64	85	65	85	67	86	71	88	75	88	69	86	62	85	63	86	67	86	66
DAYTONA BEACH, FL	58	58	88	59	87	57	87	55	86	54	85	57	87	63	89	64	91	67	90	67	87	63	88	60	88	61	88	61
FORT MYERS, FL	58	58	89	57	88	54	89	52	88	48	88	50	89	58	89	60	91	60	92	61	90	57	90	56	89	57	89	56
GAINESVILLE, FL	19	19	90	60	90	56	91	53	91	50	91	50	88	56	89	59	91	60	96	64	94	61	93	60	91	61	91	58
JACKSONVILLE, FL	66	66	88	58	87	54	87	50	87	48	86	51	88	57	89	59	91	61	92	63	91	59	90	57	89	59	89	56
KEY WEST, FL	54	54	82	69	81	67	80	66	77	64	77	65	78	68	77	67	78	67	81	70	82	69	83	69	83	70	80	68
MIAMI, FL	38	38	84	60	84	58	82	56	79	54	80	58	84	65	83	63	85	65	87	67	86	63	85	62	84	60	83	61
ORLANDO, FL	39	39	88	57	88	53	89	50	88	47	88	49	90	58	91	59	93	60	92	61	90	57	90	56	89	58	90	55
PENSACOLA, FL	39	39	82	65	82	61	84	62	86	60	87	62	84	61	86	65	87	66	85	63	82	57	82	61	81	65	84	62
TALLAHASSEE, FL	41	41	87	58	87	54	89	51	91	47	90	50	91	56	94	61	95	61	93	58	91	53	90	55	88	57	90	55
TAMPA, FL	39	39	87	60	86	57	87	55	86	52	85	53	86	60	87	64	90	65	91	63	89	58	88	58	88	60	88	59
VERO BEACH, FL	39	39	88	60	88	56	86	56	84	55	84	58	80	60	83	59	85	60	82	59	81	58	79	56	81	56	83	58
WEST PALM BEACH, FL	38	38	84	59	83	57	82	56	79	55	80	59	84	66	85	64	86	64	87	66	84	63	84	61	84	60	83	61
ATHENS, GA	47	47	81	58	80	54	81	53	83	50	86	54	88	56	90	58	92	59	92	59	89	55	85	54	82	58	86	56
ATLANTA, GA	42	42	79	59	77	55	77	52	79	50	82	53	84	56	88	59	89	60	88	59	84	54	82	56	80	59	82	56
AUGUSTA,GA	38	38	84	54	83	49	84	48	86	45	87	49	87	52	89	55	92	57	92	55	91	50	89	50	85	53	87	51
COLUMBUS, GA	57	57	84	59	83	54	84	51	85	48	85	50	85	53	89	57	90	56	89	56	88	52	87	54	84	58	86	54
MACON, GA	38	38	84	58	84	54	86	52	88	49	88	50	88	54	90	57	93	57	93	58	90	52	88	53	85	57	88	54
SAVANNAH, GA	38	38	83	55	82	51	84	49	84	46	86	51	88	56	89	58	91	60	91	60	89	54	87	53	84	55	87	54
HILO, HI	53	53	79	67	78	66	80	67	81	69	80	68	79	66	81	68	81	69	80	68	80	69	82	71	81	69	80	68
HONOLULU,HI	33	33	81	61	78	59	74	57	70	56	68	54	67	52	68	52	68	52	69	53	71	56	75	59	79	61	72	56
KAHULUI, HI	38	38	83	62	81	60	77	59	75	58	71	56	68	53	71	56	72	56	71	55	74	57	77	60	80	61	75	58
LIHUE, HI	53	53	82	67	80	66	78	66	77	67	75	66	75	66	76	66	76	66	77	65	78	68	80	69	81	69	78	67
BOISE, ID	63	63	80	70	79	60	73	44	70	36	69	34	66	29	54	21	52	22	58	29	66	38	77	60	81	71	69	43
LEWISTON, ID	44	44	80	70	79	61	76	50	74	43	75	40	73	36	60	25	57	25	66	32	78	49	82	68	81	74	74	48
POCATELLO, ID	39	39	80	71	80	62	76	50	71	38	71	35	71	32	65	25	62	23	66	28	70	37	77	60	80	72	72	44
CAIRO,IL	22	22	80	67	79	64	78	59	77	54	82	57	83	57	84	59	87	59	87	57	85	53	80	58	79	66	82	59
CHICAGO,IL	44	44	78	70	78	67	79	63	77	58	77	57	79	58	82	60	86	61	85	61	81	59	80	66	80	71	80	63
MOLINE, IL	42	42	76	69	77	67	78	63	78	58	80	57	82	58	85	62	89	64	87	62	81	59	80	66	79	71	81	63

PEORIA, IL	43	43	80	71	81	69	81	65	78	59	81	60	82	60	86	63	89	65	87	63	84	61	83	69	83	73	83	65
ROCKFORD, IL	39	39	81	73	81	69	81	65	80	60	80	58	82	60	86	62	91	64	90	63	85	61	83	69	83	74	83	65
SPRINGFIELD, IL	43	43	80	71	80	70	81	66	79	60	81	58	83	59	86	63	89	64	88	61	83	59	82	67	83	73	83	64
EVANSVILLE, IN	41	41	79	69	79	66	79	62	78	58	82	59	83	59	86	61	88	61	88	60	84	57	80	64	80	70	82	62
FORT WAYNE, IN	41	41	81	72	81	69	81	63	79	57	80	55	81	55	85	56	89	59	89	57	86	58	84	68	83	75	83	62
INDIANAPOLIS, IN	43	43	81	71	81	67	80	61	79	56	82	57	83	57	87	60	90	60	90	57	87	57	84	66	83	72	84	62
SOUTH BEND, IN	39	39	82	73	81	68	80	61	78	56	79	54	81	55	84	57	89	59	89	59	84	60	83	68	83	75	83	62
DES MOINES, IA	41	41	77	70	79	67	78	63	77	58	78	59	80	60	83	61	85	63	84	62	79	59	79	66	80	72	80	63
DUBUQUE,IA	35	35	78	72	79	69	79	65	77	60	79	61	83	64	86	65	89	66	87	65	81	62	81	69	82	74	82	66
SIOUX CITY, IA	43	43	78	71	80	69	80	66	78	57	79	58	82	61	86	63	89	66	86	63	81	58	82	67	82	73	82	64
WATERLOO, IA	43	43	78	72	80	71	82	68	81	59	81	58	84	60	87	63	90	64	89	63	83	61	83	69	82	74	83	65
CONCORDIA, KS	40	40	78	67	79	64	78	59	80	57	84	61	84	59	81	56	83	59	82	58	78	55	80	63	79	67	80	61
DODGE CITY, KS	39	39	76	61	76	58	76	54	76	51	81	56	80	53	76	50	79	52	79	53	75	51	77	57	76	60	77	55
GOODLAND, KS	36	36	76	61	77	53	78	48	78	43	84	48	82	42	82	40	83	42	79	41	75	45	76	59	75	61	79	48
TOPEKA, KS	38	38	78	66	78	64	78	60	80	58	84	62	86	63	85	63	87	62	87	61	83	58	81	64	80	67	82	62
WICHITA, KS	49	49	79	65	78	62	77	57	78	56	83	60	83	56	79	53	79	53	81	57	80	56	79	60	80	65	80	58
GREATER CINCINNATI AP	40	40	80	69	78	64	78	59	77	54	81	56	84	57	86	58	89	58	89	57	84	56	80	63	81	69	82	60
JACKSON, KY	21	21	78	64	76	60	73	53	71	48	82	57	86	62	90	63	91	62	89	60	83	55	76	58	79	65	81	59
LEXINGTON, KY	39	39	81	69	79	64	77	58	76	55	81	58	84	58	86	59	88	59	88	58	85	57	81	63	81	68	82	60
LOUISVILLE, KY	42	42	78	65	77	61	76	57	76	52	82	56	83	57	85	58	87	57	88	57	85	55	80	61	79	66	81	59
PADUCAH KY	18	18	81	71	80	68	77	65	80	62	87	66	88	67	90	69	92	69	91	67	86	65	82	68	82	71	85	67
BATON ROUGE, LA	43	43	85	67	84	62	86	61	89	60	91	62	92	63	92	66	92	66	91	64	89	59	89	63	87	66	89	63
LAKE CHARLES, LA	38	38	87	72	87	67	89	67	90	65	93	67	93	68	94	69	94	68	92	67	91	62	89	66	89	70	91	67
NEW ORLEANS, LA	54	54	85	68	84	65	84	63	87	62	89	62	90	65	91	68	91	68	89	67	87	62	86	64	85	68	87	65
SHREVEPORT, LA	50	50	83	66	82	62	83	60	86	60	90	63	90	62	90	61	90	59	89	60	88	59	86	62	85	65	87	62
CARIBOU, ME	58	58	75	67	75	63	76	60	76	56	74	52	78	56	83	58	86	59	88	61	86	62	85	71	80	71	80	61
PORTLAND, ME	62	62	76	61	76	57	75	58	73	55	75	58	78	60	80	59	83	59	86	60	84	59	82	62	79	61	79	59
BALTIMORE, MD	49	49	73	57	72	54	72	51	72	49	77	52	77	52	80	53	84	55	85	55	84	54	79	54	75	57	78	54
BLUE HILL, MA	49	49	76	62	75	59	75	57	72	52	75	55	78	58	80	56	82	58	83	59	80	56	79	60	75	61	78	58
BOSTON, MA	38	38	69	58	68	56	70	57	69	55	72	59	73	58	74	57	77	59	79	61	77	58	74	59	70	59	73	58
WORCESTER, MA	47	47	73	60	72	57	71	55	68	50	70	51	75	57	77	58	79	59	82	61	78	56	78	61	75	62	75	57
ALPENA, MI	43	43	81	71	80	66	83	61	80	54	78	52	80	52	85	54	90	58	91	61	87	61	84	69	83	73	83	61
DETROIT, MI	44	44	80	70	79	65	79	60	78	54	78	53	79	54	82	54	86	57	87	57	84	57	82	65	81	70	81	60
FLINT, MI	39	39	81	72	80	68	80	61	78	56	78	54	81	56	84	55	89	58	90	59	85	60	83	68	82	74	83	62
GRAND RAPIDS, MI	39	39	82	73	81	68	81	63	79	57	79	53	82	56	84	56	89	59	89	60	86	62	83	70	83	75	83	63
HOUGHTON LAKE, MI	38	38	84	73	83	68	84	62	80	54	78	50	82	55	86	55	91	60	92	62	88	64	87	73	85	76	85	63
LANSING, MI	39	39	82	73	81	68	81	62	79	56	78	54	82	57	86	57	91	60	91	61	88	63	85	70	85	76	84	63
MUSKEGON, MI	42	42	81	75	81	70	80	63	77	57	76	55	81	58	84	59	89	62	89	63	84	65	81	70	81	75	82	64
SAULT STE. MARIE, MI	61	61	81	74	81	70	82	66	80	59	79	55	85	62	88	62	92	63	92	67	89	67	86	75	84	77	85	66
DULUTH, MN	41	41	78	72	77	68	78	66	76	59	76	56	82	63	85	63	88	66	88	67	82	65	81	72	80	75	81	66
INTERNATIONAL FALLS, MN	60	60	75	70	74	66	76	62	76	55	77	53	83	59	88	60	91	63	90	66	85	65	84	75	80	75	82	64
MINNEAPOLIS-ST.PAUL, MN	43	43	76	69	76	67	76	64	74	55	75	55	78	58	81	59	84	61	84	63	80	61	80	68	78	71	78	63
ROCHESTER, MN	42	42	81	76	81	74	82	71	80	63	80	60	83	62	86	65	89	67	88	67	83	64	84	73	84	78	83	68
SAINT CLOUD, MN	50	50	78	71	79	68	81	65	80	55	80	54	85	59	88	59	91	62	90	63	85	61	83	70	80	73	83	63
JACKSON, MS	39	39	86	68	86	63	86	60	90	58	91	60	91	61	93	64	94	63	93	62	92	59	90	62	87	66	90	62
MERIDIAN, MS	38	38	86	65	86	61	87	58	90	58	91	61	91	61	92	64	93	63	91	62	91	58	89	60	87	64	89	61
TUPELO, MS	19	19	82	70	80	67	80	61	84	61	88	65	89	65	90	66	91	66	90	65	88	63	85	67	83	70	86	66
COLUMBIA, MO	33	33	80	69	80	67	78	62	78	59	85	65	87	65	87	63	88	63	87	63	84	62	81	66	81	70	83	64
KANSAS CITY, MO	30	30	77	67	78	66	77	62	77	59	83	63	85	64	85	64	86	64	85	64	80	60	79	66	79	68	81	64
ST. LOUIS, MO	42	42	81	68	80	65	79	61	77	58	81	59	82	59	83	60	86	60	86	61	82	59	81	65	82	69	82	62

SPRINGFIELD, MO	42	42	78	65	78	63	77	59	79	59	85	63	87	64	87	62	87	60	87	63	82	59	80	63	80	66	82	62
BILLINGS, MT	43	43	65	57	66	51	68	46	69	42	70	42	72	39	64	32	61	30	65	37	64	43	65	54	65	57	66	44
GLASGOW, MT	38	38	77	73	79	70	80	58	75	42	74	40	77	41	74	35	69	32	72	37	75	47	80	65	79	73	76	51
GREAT FALLS, MT	41	41	67	61	67	55	69	49	69	42	71	41	72	41	68	31	66	30	68	37	65	44	65	56	65	60	68	46
HELENA, MT	37	37	72	64	73	54	73	46	70	39	71	38	73	38	67	30	68	30	72	35	73	43	74	58	73	66	72	45
KALISPELL, MT	38	38	82	76	82	67	81	54	78	43	80	44	85	46	84	36	82	35	84	42	85	53	84	73	83	79	82	54
MISSOULA, MT	42	42	85	76	85	66	83	51	80	42	81	42	83	42	78	31	75	30	82	38	85	50	86	71	86	80	82	52
GRAND ISLAND, NE	41	41	77	66	78	64	79	60	79	54	82	57	82	56	83	58	85	59	84	57	79	53	80	61	79	66	81	59
LINCOLN, NE	30	30	78	68	80	66	80	63	80	58	83	61	83	59	83	60	86	63	84	61	81	58	81	64	81	68	82	62
NORFOLK, NE	57	57	76	66	79	66	80	63	78	53	80	54	82	56	83	57	86	59	83	56	79	53	79	61	79	67	80	59
NORTH PLATTE, NE	38	38	80	66	79	63	80	58	80	53	83	57	83	58	83	57	85	58	83	54	81	52	81	60	80	64	81	58
OMAHA EPPLEY AP, NE	38	38	79	68	77	64	78	61	77	57	80	59	82	61	85	63	87	65	86	63	81	59	81	66	81	70	81	63
OMAHA (NORTH), NE	9	9	75	63	77	63	78	59	76	53	79	55	79	56	85	63	86	62	84	60	78	55	79	65	77	67	79	60
SCOTTSBLUFF, NE	37	37	74	58	75	48	77	44	76	41	80	42	80	39	81	37	83	39	80	37	76	42	77	53	75	58	78	45
VALENTINE, NE	35	35	76	63	77	64	79	61	77	54	78	54	79	54	78	53	79	53	77	51	75	52	76	59	75	62	77	57
ELKO, NV	35	35	78	60	79	52	77	41	72	33	71	30	63	24	54	18	53	19	59	22	64	27	74	47	76	58	68	36
ELY, NV	50	50	73	55	75	50	72	42	69	34	67	30	58	23	52	21	55	23	59	24	64	31	71	46	72	54	65	36
LAS VEGAS, NV	42	42	55	32	51	28	45	23	35	16	32	14	24	11	28	15	33	17	34	17	36	20	45	27	53	32	39	21
RENO, NV	39	39	79	50	74	40	69	33	65	28	64	25	62	22	60	18	61	19	66	22	70	27	74	40	77	50	68	31
WINNEMUCCA, NV	53	53	79	58	77	47	73	38	67	30	64	27	58	22	46	16	45	16	53	20	62	28	74	46	79	58	65	34
CONCORD, NH	37	37	76	59	76	55	77	53	75	46	77	47	81	52	84	51	88	52	90	55	88	52	84	59	80	61	81	53
MT. WASHINGTON, NH	34	34	83	83	81	83	84	84	85	84	84	81	86	82	88	84	87	85	82	83	80	79	82	82	82	82	84	83
ATLANTIC CITY AP, NJ	38	38	79	59	79	55	77	54	77	52	79	55	81	56	83	57	87	58	88	58	88	56	84	57	79	59	82	56
NEWARK, NJ	37	37	73	59	72	54	70	51	66	48	70	51	71	52	72	51	76	53	78	55	79	53	76	56	74	58	73	53
ALBUQUERQUE, NM	42	42	68	39	63	31	55	24	48	19	47	19	46	18	59	27	65	31	61	30	60	30	64	36	69	43	59	29
CLAYTON, NM	45	45	64	48	65	42	65	37	64	32	70	37	71	35	76	41	77	42	72	40	65	41	64	47	62	53	68	41
ROSWELL, NM	29	29	71	41	65	33	58	26	54	22	58	24	65	27	68	32	73	35	74	38	69	36	69	39	69	42	66	33
ALBANY, NY	37	37	78	64	77	58	76	54	72	49	75	53	79	56	81	55	86	58	89	59	86	58	82	63	80	65	80	58
BINGHAMTON, NY	51	51	80	71	79	66	79	62	76	56	78	56	83	59	84	58	89	60	90	63	85	62	82	69	82	73	82	63
BUFFALO, NY	42	42	79	73	79	69	80	65	77	58	76	56	78	57	79	55	83	58	84	60	82	60	80	68	81	72	80	63
ISLIP, NY	42	42	76	62	76	58	77	57	76	55	76	56	71	53	74	56	77	56	79	56	78	54	74	55	70	54	75	56
NEW YORK C.PARK, NY	68	68	68	60	68	57	68	54	67	51	71	53	74	56	75	55	78	57	79	57	76	55	73	59	69	60	72	56
NEW YORK (JFK AP), NY	41	41	71	60	71	57	71	56	70	55	73	59	75	60	75	59	78	60	80	60	78	57	76	59	72	60	74	58
NEW YORK (LAGUARDIA AP), NY	40	40	67	58	65	55	67	53	67	51	71	53	72	54	72	53	75	55	76	57	74	55	71	58	68	59	70	55
ROCHESTER, NY	39	39	78	69	79	66	79	62	77	55	77	54	80	56	83	55	87	58	88	61	85	60	81	67	81	72	81	61
SYRACUSE, NY	39	39	77	69	78	64	78	60	76	53	76	55	79	56	81	56	86	58	87	61	84	61	81	67	81	71	80	61
ASHEVILLE, NC	38	38	85	59	83	55	84	53	85	50	91	56	94	60	95	62	97	62	97	62	93	56	88	56	85	59	90	57
CAPE HATTERAS, NC	45	45	80	68	80	65	80	63	78	60	81	65	83	68	85	70	86	70	84	68	82	65	81	65	80	67	82	66
CHARLOTTE, NC	42	42	78	55	76	52	78	49	78	46	82	52	84	55	86	56	88	57	89	57	86	53	83	53	79	55	82	53
GREENSBORO-WNSTN-SALM-HGHPT,NC	39	39	78	56	76	52	77	50	78	48	82	54	84	56	87	59	90	60	90	59	88	54	83	53	79	56	83	55
RALEIGH, NC	38	38	80	55	78	52	80	49	81	46	85	54	87	56	89	58	91	59	92	59	90	53	85	52	81	55	85	54
WILMINGTON, NC	39	39	81	56	80	52	82	52	81	48	84	55	85	60	87	63	90	64	90	62	89	56	85	53	82	55	85	56
BISMARCK, ND	43	43	76	71	79	70	81	66	79	55	79	53	84	57	84	53	83	52	82	54	79	55	81	67	79	72	81	61
FARGO, ND	43	43	76	73	78	74	82	72	79	59	76	53	82	59	85	59	86	58	84	61	80	62	82	72	79	75	81	65
WILLISTON, ND	41	41	79	74	81	73	83	67	79	55	77	52	81	54	80	51	77	51	79	55	79	58	82	71	81	75	80	61
AKRON, OH	39	39	80	71	79	66	78	60	76	54	78	56	81	57	84	56	88	59	88	60	84	59	80	66	80	71	81	61
CLEVELAND, OH	42	42	79	70	78	68	79	63	77	58	78	58	80	58	82	57	86	60	85	60	81	60	78	66	78	71	80	62
COLUMBUS, OH	43	43	78	68	77	64	76	57	76	53	79	55	81	55	84	56	87	57	87	57	83	55	80	63	79	69	81	59
DAYTON, OH	39	39	79	70	79	66	79	61	77	55	78	55	80	55	82	56	87	57	87	56	83	57	81	65	81	71	81	60
MANSFIELD, OH	36	36	82	73	81	69	80	63	78	57	79	57	81	58	83	58	88	61	88	60	83	59	81	67	83	74	82	63

Average Relative Humidity(%)

TOLEDO, OH	47	47	81	70	80	66	81	60	79	54	80	53	82	54	85	55	91	59	91	57	86	57	83	66	83	73	84	60
YOUNGSTOWN, OH	55	55	81	72	80	68	80	63	77	56	79	54	82	56	85	56	89	57	89	59	85	58	82	67	82	72	83	61
OKLAHOMA CITY, OK	37	37	78	62	77	60	76	57	77	56	83	62	84	61	80	55	80	55	83	59	80	57	80	60	78	62	80	59
TULSA, OK	42	42	78	63	76	59	75	56	77	55	85	62	85	63	81	57	82	56	85	62	82	57	80	61	79	63	81	60
ASTORIA, OR	49	49	87	78	86	74	88	71	89	70	89	70	90	71	90	70	91	71	91	70	90	73	87	78	86	81	89	73
EUGENE, OR	45	45	92	80	92	72	91	65	90	58	91	55	90	50	87	39	88	39	89	43	93	62	93	78	92	84	91	60
MEDFORD, OR	41	41	90	70	88	57	86	50	84	45	83	39	78	33	74	26	74	26	78	29	86	42	91	67	91	76	84	47
PENDLETON, OR	61	61	80	75	78	65	74	50	71	42	70	38	66	33	55	24	54	26	61	32	72	47	80	70	81	78	70	48
PORTLAND, OR	62	62	85	76	85	67	85	60	86	55	85	53	83	49	82	45	83	45	86	48	90	62	88	74	86	78	85	59
SALEM, OR	40	40	87	76	88	68	88	61	88	57	88	53	87	49	85	41	85	40	87	45	90	60	90	77	89	80	88	59
SEXTON SUMMIT, OR	7	7	80	72	78	70	84	68	84	63	73	53	73	49	65	40	66	42	65	45	70	58	81	75	79	75	75	59
GUAM, PC	9	9	87	73	87	72	86	70	88	70	89	72	88	73	90	77	91	78	92	79	90	77	88	77	87	76	89	74
JOHNSTON ISLAND, PC	23	23	76	68	77	68	78	70	79	71	78	70	77	69	78	69	79	71	80	72	80	72	79	73	78	72	78	70
KOROR, PC	51	51	80	76	80	75	78	73	78	74	79	77	81	78	81	78	80	77	79	76	79	77	79	77	80	77	80	76
KWAJALEIN, MARSHALL IS., PC	42	42	79	72	78	70	79	71	81	74	83	77	81	75	84	77	83	77	83	76	83	76	83	76	81	75	81	75
MAJURO, MARSHALL IS, PC	47	47	80	75	79	74	80	75	83	77	83	78	84	78	84	78	83	77	82	76	82	76	83	77	82	77	82	76
PAGO PAGO, AMER SAMOA, PC	34	34	88	75	88	75	89	75	89	76	87	76	85	76	83	74	84	74	84	74	84	76	84	76	85	75	86	75
POHNPEI, CAROLINE IS., PC	32	32	85	78	84	76	85	77	88	79	90	81	92	80	94	79	95	79	95	79	94	79	93	80	87	79	90	79
CHUUK, E. CAROLINE IS., PC	32	32	81	76	81	75	82	75	84	77	85	78	86	78	88	78	88	77	88	77	87	78	86	78	83	79	85	77
WAKE ISLAND, PC	45	45	77	66	78	66	80	67	81	68	82	68	82	68	82	70	83	71	83	71	82	71	80	69	78	67	81	69
YAP, W CAROLINE IS., PC	54	54	79	76	78	74	77	73	76	73	78	75	80	77	81	77	82	78	81	78	81	78	80	78	80	77	79	76
ALLENTOWN, PA	52	52	76	62	76	57	75	53	74	50	78	53	80	54	82	53	86	56	88	57	87	55	82	59	79	62	80	56
ERIE, PA.	37	37	78	72	77	70	77	65	75	62	76	62	79	64	80	64	82	65	82	65	77	63	76	68	77	72	78	66
HARRISBURG, PA	49	49	72	58	71	55	72	52	70	49	74	52	77	53	79	52	83	55	85	56	82	54	77	57	73	58	76	54
MIDDLETOWN/HARRISBURG INTL APT	37	37	73	59	72	55	72	53	71	50	75	52	76	52	78	52	81	54	84	55	81	54	76	56	72	58	76	54
PHILADELPHIA, PA	43	43	74	60	72	55	72	53	71	50	75	53	77	53	78	54	81	54	83	56	83	54	78	56	74	59	76	55
PITTSBURGH, PA	42	42	77	66	75	62	76	57	74	51	77	52	80	53	83	54	86	56	87	57	82	55	79	62	78	67	79	58
AVOCA, PA	47	47	76	66	75	61	74	57	72	52	76	52	82	56	83	55	86	58	88	60	84	58	79	63	77	67	79	59
WILLIAMSPORT, PA	57	57	77	62	76	58	77	53	75	49	80	51	84	54	87	55	90	57	92	59	89	57	82	61	78	63	82	57
BLOCK IS.,RI	15	15	73	65	73	65	75	65	79	65	80	66	83	69	87	72	86	71	84	70	80	66	76	65	72	65	79	67
PROVIDENCE, RI	39	39	72	57	71	54	72	53	70	49	73	53	76	56	77	56	80	56	82	57	81	54	78	57	74	58	75	55
CHARLESTON AP,SC	60	60	83	56	82	52	83	50	84	49	85	53	86	59	88	62	90	63	90	62	89	56	86	53	84	55	86	56
COLUMBIA, SC	36	36	83	54	82	49	84	48	84	44	85	48	86	51	88	53	91	56	92	55	91	51	89	51	84	53	86	51
GREENVILLE-SPARTANBURG AP, SC	40	40	77	55	76	51	76	50	78	48	83	53	85	54	87	56	89	58	89	59	86	53	82	53	79	55	82	54
ABERDEEN, SD	34	34	79	73	80	74	83	70	82	59	81	57	84	61	86	59	87	58	85	58	82	59	83	71	81	74	83	65
HURON, SD	43	43	77	70	80	71	83	68	82	59	83	59	85	61	86	58	88	59	86	58	81	58	82	66	80	71	83	63
RAPID CITY, SD	52	52	69	64	71	61	75	54	73	47	76	48	78	49	74	41	72	37	68	39	67	46	69	60	69	64	72	51
SIOUX FALLS, SD	39	39	78	71	80	71	82	67	81	59	81	58	81	60	84	60	86	62	85	61	81	60	83	69	81	73	82	64
BRISTOL-JHNSN CTY-KNGSPRT,TN	41	41	81	62	80	58	80	52	82	50	89	55	90	58	92	61	93	60	93	57	90	53	85	56	82	62	86	57
CHATTANOOGA, TN	72	72	82	62	81	57	81	53	82	49	86	53	87	55	89	57	91	57	91	56	90	53	85	56	83	61	86	56
KNOXVILLE, TN	42	42	82	64	80	59	80	55	82	52	87	57	89	59	90	61	92	60	92	59	90	56	85	59	83	64	86	59
MEMPHIS, TN	63	63	78	65	77	61	76	58	77	56	81	58	82	59	84	60	85	59	85	58	82	54	79	58	78	64	80	59
NASHVILLE, TN	37	37	79	66	79	62	77	57	79	56	85	60	86	60	88	61	89	61	89	62	86	58	81	62	80	66	83	61
ABILENE, TX	39	39	72	56	72	56	70	51	72	50	78	55	78	54	71	49	72	50	76	56	75	54	75	56	73	56	74	54
AMARILLO, TX	41	41	71	53	72	52	69	46	68	42	75	48	77	49	73	46	77	50	79	52	73	48	73	50	71	52	73	49
AUSTIN, TX	41	41	78	63	78	61	79	59	82	60	88	64	88	61	87	56	85	55	85	59	83	59	82	62	79	63	83	60
BROWNSVILLE, TX	36	36	88	70	89	66	88	63	89	64	90	65	90	64	91	60	91	61	91	65	90	64	87	66	87	69	89	65
CORPUS CHRISTI, TX	38	38	87	70	87	68	87	65	89	66	92	70	93	67	93	62	92	62	90	65	89	63	87	66	86	68	89	66
DALLAS-FORT WORTH, TX	39	39	79	63	78	61	79	59	81	59	86	63	85	59	79	53	78	53	82	59	82	58	81	61	80	63	81	59
DEL RIO, TX	23	23	74	60	72	57	70	54	74	57	78	61	78	60	74	57	75	59	80	62	80	63	80	63	75	59	76	60

Average Relative Humidity(%)

EL PASO, TX	42	42	65	34	55	27	47	21	39	17	41	17	45	19	61	29	65	33	66	33	63	30	61	33	65	38	56	27
GALVESTON, TX	96	96	85	77	84	74	85	74	86	75	84	73	81	70	81	70	81	69	81	68	80	65	83	72	85	76	83	72
HOUSTON, TX	33	33	85	68	86	65	87	65	89	64	91	66	92	65	92	63	92	63	92	64	91	62	89	65	87	67	89	65
LUBBOCK, TX	55	55	72	52	71	52	67	44	67	42	74	47	76	48	73	49	76	52	79	54	77	51	73	49	72	51	73	49
MIDLAND-ODESSA, TX	39	39	71	51	71	48	65	40	66	38	73	43	75	46	70	45	73	47	78	53	78	49	75	49	72	49	72	46
PORT ARTHUR, TX	42	42	88	71	87	67	88	66	90	66	92	68	93	68	94	70	94	69	92	68	91	63	89	66	89	70	91	68
SAN ANGELO, TX	42	42	75	56	75	53	71	48	73	47	79	53	80	54	75	48	76	50	82	58	81	56	80	56	78	56	77	53
SAN ANTONIO, TX	60	60	80	61	80	59	79	57	82	59	87	62	87	60	86	55	85	54	85	57	84	57	81	59	80	60	83	58
VICTORIA, TX	41	41	87	69	87	66	87	63	89	64	91	66	92	65	92	62	92	62	92	65	90	62	89	64	87	68	90	65
WACO, TX	39	39	83	66	82	64	82	62	84	62	88	65	86	60	81	53	79	51	84	58	84	59	84	63	83	65	83	61
WICHITA FALLS, TX	42	42	79	59	78	58	78	54	80	53	85	57	84	55	76	48	77	49	83	56	82	55	82	57	80	59	80	55
SALT LAKE CITY, UT	43	43	79	69	78	60	70	46	66	39	65	34	59	26	52	22	53	24	61	30	68	41	75	59	79	71	67	43
BURLINGTON, VT	37	37	73	64	74	61	75	58	73	52	73	51	77	54	78	53	83	56	86	60	81	60	78	65	77	67	77	59
LYNCHBURG, VA	39	39	73	54	73	50	73	48	73	45	81	52	83	55	86	57	86	56	88	57	86	52	80	52	76	54	80	53
NORFOLK, VA	54	54	75	59	75	57	74	54	74	51	77	56	79	57	81	59	84	61	84	61	83	59	79	57	76	59	78	57
RICHMOND, VA	68	68	80	57	79	53	78	49	76	46	80	51	82	53	85	56	88	57	90	56	89	53	84	51	81	55	83	53
ROANOKE, VA	38	38	70	53	70	50	70	48	71	47	79	52	81	54	83	55	87	56	88	57	83	52	76	52	72	54	78	52
WALLOPS ISLAND, VA	24	24	77	63	76	62	77	61	77	58	79	64	82	64	84	65	86	66	85	64	84	60	81	61	77	62	80	63
OLYMPIA, WA	42	42	92	81	92	71	92	62	91	57	91	55	91	54	90	50	91	50	93	54	94	67	93	80	92	85	92	64
QUILLAYUTE, WA	36	36	91	84	90	77	91	73	92	69	94	67	94	68	94	66	95	68	94	68	94	76	92	84	91	86	93	74
SEATTLE SEA-TAC AP, WA	43	43	82	75	81	67	83	62	84	58	84	55	83	54	82	49	84	51	87	56	88	67	85	75	83	78	84	62
SPOKANE, WA	43	43	86	79	85	69	82	55	78	44	77	41	75	36	65	28	63	28	70	34	80	49	87	76	88	83	78	52
YAKIMA, WA	53	53	84	71	82	58	78	42	73	34	71	31	70	31	68	26	71	28	76	32	80	43	84	63	85	76	77	45
SAN JUAN, PR	47	47	82	65	80	62	77	61	75	62	78	66	76	65	79	67	80	67	79	67	80	67	81	68	82	66	79	65
BECKLEY, WV	39	39	80	67	79	64	78	58	75	52	81	55	86	60	89	63	91	63	91	63	86	57	80	60	80	66	83	61
CHARLESTON, WV	55	55	78	63	78	59	76	53	76	48	84	52	87	55	90	60	93	59	92	57	89	54	81	56	79	63	84	57
ELKINS, WV	39	39	80	65	81	60	82	56	82	51	87	54	91	58	94	61	96	61	95	61	90	54	84	59	82	65	87	59
HUNTINGTON, WV	41	41	78	65	77	61	76	54	76	49	85	55	88	58	90	60	92	60	92	59	88	55	80	59	79	65	84	58
GREEN BAY, WI	41	41	78	72	79	70	81	67	79	61	79	58	82	62	86	62	90	65	90	66	85	65	83	71	81	74	83	66
LA CROSSE, WI	41	41	78	68	79	66	80	62	78	54	79	54	82	56	85	57	89	60	88	61	81	59	80	66	79	70	81	61
MADISON, WI	43	43	79	71	80	68	81	65	80	58	80	57	82	60	86	61	90	64	91	65	85	62	84	69	82	73	83	64
MILWAUKEE, WI	42	42	76	70	77	68	78	66	77	63	77	62	79	63	82	64	86	66	85	66	80	64	79	69	79	72	80	66
CASPER, WY	38	38	66	60	68	55	71	46	75	42	78	40	75	33	71	26	67	25	68	31	68	42	69	57	68	62	70	43
CHEYENNE, WY	43	43	58	51	62	49	66	47	69	43	73	45	72	41	70	38	70	39	67	39	62	42	60	51	58	53	66	45
LANDER, WY	56	56	68	60	68	54	66	46	65	40	66	37	61	32	55	27	53	27	58	33	63	41	69	57	67	61	63	43
SHERIDAN, WY	38	38	70	66	72	60	74	51	74	46	77	47	78	46	73	35	69	32	71	38	72	48	73	62	71	66	73	50

 **Top of Page**

 [NCDC](#) / [Get/View Data](#) / [Comparative Climatic Data](#) / [Search](#)

http://www.ncdc.noaa.gov/oa/climate/online/ccd/avgrh.html
Downloaded Thursday, 06-May-2004 17:39:56 EDT
Last Updated Monday, 21-Apr-2003 09:10:44 EDT by Dan.Dellinger@noaa.gov
Please see the [NCDC Contact Page](#) if you have questions or comments.